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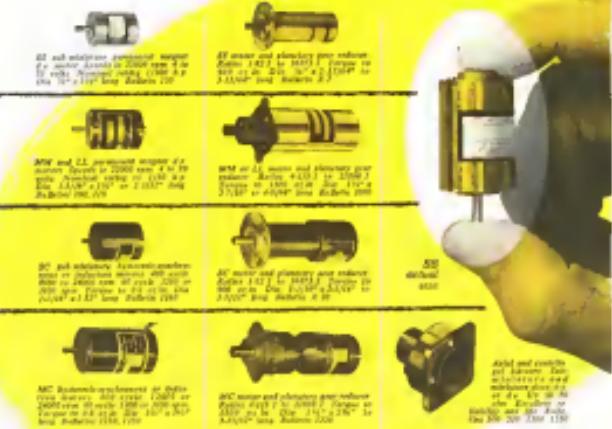
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AVIATION WEEK, February 13, 1966

Borden Quits, Starts R&D Fight

► Research chief's resignation forces issue of need for funds to keep pace with Red technical progress.

Convair Creates Basic Research Facility

► New organization puts basic research activities on separate plane from product development, engineering demands

Cal Tech Plays Vital Missile Research Role

► Jet Propulsion Laboratory sparks research in fundamental nature, application of missiles, rockets.

U. K. Subsidizes Super Britannia Program

► Convair's Concorde eliminated from plans to build advanced turbofan in British effort to compete with U. S.

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COVER: Marine F-4J light bomber, armed with 16 500-lb HEAT bombs, flies over Maryland on a test mission. B-57s and C models are deleted except for dual-control C's, the C's, making the T-tail Air Commandos bombers to become a throwback. Both versions are powered by two Wright J6 engines. Marine is developing D and E models. The D probably will be equipped with the Pratt & Whitney J75 engines. The E would use a high bypass ratio engine with Hughes J75 engines. The D has a maximum weight of about 30,000 pounds, while the E would be about 35,000 pounds. The D probably would be used for close air support, while the E would be used for interdiction. The D has a range of about 1,000 miles at altitude and a high rate of climb. Current plans call for Boeing Olympian J75 engines with the same static thrust rating of 16,000 lb. The D could make a 300-mile round trip at a speed of 500 mph.

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EDITORIAL

Clarification on the B-52

Because of a national wire service story that quoted AVIATION WEEK erroneously on the status of the Boeing B-52 program, we feel clarification is necessary. The wire service story quoted AVIATION WEEK as saying that the Fiscal 1957 aerospace budget had "locked" the program to equip the Air Force with modern long range striking power. It further stated that we said the "budget for the next fiscal year beginning in July wipes out the program to re-equip the Strategic Air Command with long-range B-52 jet bombers and KC-135 jet tankers."

This is not what AVIATION WEEK said. In the editorial of Jan. 23 we wrote:

"General LeMay's proposal to re-equip SAC AS FAST AS POSSIBLE with longer range B-52s and then get tankers program has been justified by the Fiscal 1957 aerospace budget. For the next several years the retaliatory power of SAC will be significantly curtailed by this production stretchout and its future power will be delayed by the research fund cutback."

The B-52 program that has been justified is Gen. LeMay's proposal to COMPLETELY re-equip SAC with B-52s AS FAST AS POSSIBLE. The USAF program as it stands will equip only 11 wings—about one-third of SAC's bomber wings—with the B-52 at a production rate selected by a 48-hour work week and no overtime labor. The re-equipping of a part of SAC's bomber wings is proceeding at a rate dictated by budgetary considerations, rather than the military agency involved in a major deterioration of the long range atomic striking power, which is the current backbone of national policy.

Boeing is producing the B-52 at its Seattle and Wichita plants, setting a two-shift, 40-hour week. Boeing's production is meeting the limited delivery rate set by the USAF budget. SAC now has only a training wing of B-52s in operation and will get planes for its first operational B-52 wing soon. However, Boeing's two plants could well fill out B-52s at a much faster rate than the schedule set by USAF. SAC could be re-equipped much faster to reduce the length of the critical period when it's long range striking power will be dependent primarily on the obsolete B-50.

The essential differences between the current USAF B-52 program and the one proposed by Gen. LeMay are: **SAC is being partially re-equipped with B-52s, instead of completely re-equipped.** It will get less than 500 B-52s instead of about 1,800.

SAC is getting B-52s at a rate that is about half that at which the Strategic Air Force is getting the long-range B-50 jet bombers. Boeing's rate of B-52 production is restricted well below its real potential with present facilities because of Department of Defense budgetary limitations, despite SAC's acute military needs. Even with the slight acceleration of B-52 production authorized by Defense Department the rate will still be less than 20 a month next year.

SAC will be forced to continue to use obsolete B-52s well into 1958 as part of its long range striking force because of the artificially slow B-52 production rate.

The difference between the USAF B-52 policy imposed by Defense Department limitations on the budget and the program based on military urgency prepared by Gen. LeMay is typical of the widening gulf between the real needs of our modern military equipment and the artificial limits being set by concern over spending. Since the Russians are twice as big as Britain twice as fast as SAC is getting B-52s, it is one of the most critical.

Quarles on Policy

There has been widespread industry interest in the new Air Force industrial mobilization policy and in fact on other aspects of USAF development and procurement policies. Early this month Air Force Secretary Donald A. Quarles made an unusually clear and detailed statement on these matters. Because of the great industrial interest and the relatively limited audience before which Mr. Quarles spoke we are presenting the pertinent excerpts on these points.

"The new industrial readiness policy, which is intended primarily as a guide for our government offices, includes three major elements: **flexibility, hardness, flexibility.**

First, dispensal. Though our policy on dispensal was issued separately it properly and logically is part of our industrial readiness plan. An aircraft industry whose components are well dispersed is obviously less vulnerable to enemy attack than one concentrated in major population centers, particularly along our coasts.

"When we have a closer view we will find new production centers away from lucrative target areas. Dispersion is a positive consideration in selecting sites for new facilities furnished at federal expense or built with federal aid. Within the philosophy of getting the best possible Air Force in being out of our available dollars we intend to keep the pressure on to encourage dispersal."

Second, hardness. This one is a little difficult to define in a few words. I would consider a plant's ability to withstand an attack its toughness. Moreover, one can take a look harder better than I can, there are comparable reasons why some production facilities are tougher than others. Are their power sources self-contained or stored by long exposed power lines? Is the facility protected by hills or mountains? Are its components and parts spread out or concentrated? These are among the many factors that make up the element of hardness.

Third, flexibility. This embraces the facility's production capacity. It includes the mechanization of equipment and personnel in the plant, the availability of additional fiber pavilions for storing extra materials, and in general the ability of the plant and its people to take on added assignments of responsibility, particularly under emergency conditions." —Robert Hora



Tested, proven, and in production... the only double-duty aircraft fire detector!

Consisting essentially of a heat-sensing element and a transistor-driven control unit, the Kidde Aircraft Fire Detector is the first to give both an immediate nozzle actuation diaphragm signal and a fire alarm when temperature reaches a critical degree. Its hermetically-sealed control unit needs no shock or vibration isolation, has no vacuum tubes, and the entire unit requires no resetting after a fire. Here's how it works:

Located in the engine nacelle, the fire-sensing element—a long, wire-like unit—transmits nacelle temperature changes to the control unit, which is pre-set so as to remain on standby throughout the normal nacelle temperature range.

When the nacelle temperature rises above maximum normal, the control unit recognizes "potential trouble" and triggers an ABNORMAL TEMPERATURE signal.

However, if there is a sudden flash of fire in the nacelle, the control unit interprets the rapid rise

in temperature as a definite danger condition, and a FIRE ALARM is activated. The pilot then operates the nozzle fire extinguishing system to put out the blaze.

During any gradual temperature rise above maximum normal, the ABNORMAL TEMPERATURE signal remains operative all through the rise, and is replaced by the FIRE ALARM when a predetermined fixed fire temperature has been reached.

Lightweight and compact, the Kidde Aircraft Fire Detector can be adapted to meet the needs of all aircraft produced today. For more information, write Kidde now.

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Walter Kidde & Company of Canada, Ltd., Montreal—Vancouver

WHO'S WHERE

In the Front Office

J. G. (Bill) Nutting Jr., vice president manufacturing, Radialdyne Co., Von Braun, Ga., chairman of Aerospace Award, Inc., Inc., succeeding Frank Smith, is assigned, who continues as a Radialdyne board member.

Jim G. R. Jeannette, president/general manager, Arvada, Colorado National Airfield, succeeding Oregon Oregon, is killed.

Gilord K. Johnson, recently elected president, Chance-Vought Inc., Dallas, Tex., formerly director of operations plan and research.

William M. Tamm, president, Firebreak Controls Inc., Alexandria, Va.

Everett F. Johnson, president, Av Cogs Inc., Washington D. C.; Ronald S. Ross has just joined General Signal Corp. and Alexander G. L. Johnson.

Victor A. Miller, L. Wayne, (HBN), ret'd, a director, National Co., Inc., Medina, Mass.

Honors and Elections

Capt. John W. Hackert and Peter J. Massey, members of the American Chelkoway Trapline, their London, New York roundtrip last August in an English Electric Canberra, Mill. 7 kilometers/hour in 34 hr. 21 min. 45.5 sec., including time spent in New York.

Lee E. Decker, vice-president engineer, Bell Telephone Co., Morton Dr., chairman of the Subcommittee on high capacity, National Advisory Committee for Aeronautics. Brookley Dobry, chief of systems and David A. Reichenbach, chief project engineer, Princeton, will serve on NASA's Information on aircraft loads and subsystems on flight problems study.

Changes

Dr. Ernest A. Kellom, research director, Project 100, has joined the University of Michigan. Dr. John W. Clark, staff engineer, Hughes Aircraft Co., controls and de-icing panel laboratories, reporting directly to vice-president/director of research, Sam and W. Eccles, head of missile division.

Robert B. Smith, chief of a new design studies section, Douglas Aircraft Co. Inc., El Segundo, Calif.; Alfred M. Marx, supervisor engineer of a new equipment and safety research group, Russell H. Walther, supervisor of weapons delivery armament and Ray G. Middlekauf, chief equipment and weapons section.

William A. Barnes, director of sales and customer service, Douglas Aircraft Co. Inc., Los Angeles, Calif.; E. A. Daniels, special assignments, A. G. Blight, director of maintenance development and maintenance sales manager, and A. P. Williamson, test equipment sales manager.

Thomas F. Healy, defense contracts sales manager, Navy Division, Bell-Werner Corp., Chicago, Ill.

[Continued on page 87]

INDUSTRY OBSERVER

►Fast Convair F-102 interceptor squadrons will become operational in July, to be followed by four more before the end of the year.

►A Navy aircraft, employing a small, lightweight device developed by the Bureau of Aeronautics, has successfully released a bomb while flying at Mach 1.2, the fastest speed ever attained for such a drop. The device enables the bomb to take a unique trajectory, overcoming tendency to yaw with the attempt at supersonic release.

►Among the agricultural airplanes to reach the field for evaluation by the end of that year will be a new Cessna equipped with Convair aerial sprayer boom gear. Fairchild Co., Los Angeles, expects to have an initial group of five of the new 24-ft set of the factory this spring.

►Latest specific fuel consumption data on Pratt & Whitney's T34 turbo-prop engine is 24 at sea level and speeds of 200 miles, .59 at 15,000 ft. and .56 at 25,000 ft. At cruise over 300 knots at 18,000 ft., specific consumption is .53.

►Next step in USAF's test program with the turboprop-powered YC-97 is a scheduled flight to Tokyo.

►Fairchild-Graze is a long-range missile under USAF sponsorship with Fairchild Arcane Division in prime contractor. Fairchild's Guided Missile Division will supply the guidance system under a sub-contract.

►General Electric Co.'s Special Projects Division is developing the so-called SDM—Strategic Defense Missile—an prime contractor with contributions by Hughes Aircraft, Bell Telephone and Raytheon. One possible design is an adaptation of the Harpoon Hawk.

►Martin Relopus anti-satellite missile is a small layout with delta control surfaces forward and trapezoidal lifting surfaces aft.

►The Second Naval Detach in Philadelphia is letting bids for the construction of a \$15 million aircraft gear and cockpit test and training facility on Government-owned land adjacent to the Lakewood, N. J., Naval Air Station. Big names will include contracts for the construction of an 8,000 ft. runway, pit, powerhouse and connecting roads.

►Vickers-Armstrongs reports that delivery of Vickers turboprop transports to Capital Aircraft will each take place within the next six weeks. Vickers, which has delivered 91 of the 274 Vickerses sold by a number of airlines, has cut its production from eight per month to six.

►First two Royal Air Force squadrons of Vickers-Armstrongs Swifts are being formed in Italy for eventual transfer to West Germany. The Swifts will be used in fighter/reconnaissance aircraft with their performance fully that of fighter requirements.

►Convair will make a decision soon as to whether the company will stay in the commercial transport market. If Convair plans for future commercial busines, it probably will be with either a turboprop or turboprop transport as the long-range, 195-passenger, double-deck fuselage version of the Super Reinheits with Bristol BE-35 turboprop engines. Convair has sold enough Metropolitan 440 transports to put its losses producing through mid-1957. Military customers probably will extend production until the end of the year.

►Navy's Bureau of Aeronautics is making an all-out effort to induce titanium producers to develop a satisfactory alloy that can be rolled into sheets and still retain its strength and malleability. One Navy spokesman explained: "We're constantly going to the assault manufacturers and saying, 'Put in more titanium in your designs, more titanium.' They tell us to provide the titanium, and they'll provide the design. We hope to find in allow that will baseline us on the sheet article, so we can tell the customer to go ahead and provide the design."

Washington Roundup

Profits, Investigations

Public hearings on military aircraft contracts will open Feb. 15 before the House Armed Services Investigating Subcommittee, headed by Rep. Edward Robert (D-La.). The 15 panel defense contractors will appear first. The plan is to call aircraft engine manufacturers and major subcontractors later.

Also, on Feb. 15, the House Appropriations Subcommittee on the Armed Services, headed by Rep. George Mahon (D-Tex.), is to consider a proposal to repair aircraft contract policies and profits. It will probably be referred publicly in about a month.

The committee staff launched a study after Mahon, in a House floor speech, announced a "place off" investigation of defense profits and declared that "there is some evidence reached injurious profits. This taxpayer is being taken for a money ride."

Expensive Profit Education

Aircraft Industries Assn. executive committee has rejected a proposal to increase the Hill & Knowlton AIA public relations budget by \$300,000 to finance a program aimed at educating the public on the aircraft profits picture.

The Hill & Knowlton proposal was offered AIA more than six months ago. Several Congressional committees announced their intention of investigating aircraft contractors' profitability contracts, and just a few weeks before the last of these committees is to open public hearings, House agency of the \$100,000 proposal: "Too much, too late," AIA probably will oppose another \$300,000 addition to the Hill & Knowlton budget to make a study on what the public thinks of the aircraft industry. A similar study first was proposed about three years ago at a meeting of AIA's Public Relations Advisory Committee, where it was discussed at length and then tabled.

'Took Town' Hearings

Senate Commerce Committee has scheduled hearings Feb. 15 and 16 on charges of inadequate air service to St. Louis. They were made by Sen. Stuart Symington (D-Mo.). He pointed out that Civil Defense Board (CDB) is determined to keep St. Louis a "link town." He said the city has no direct air service to the Pacific Northwest and inadequate service to New York, Boston, Chicago, the South and Southwest.

Airpower Investigation

There will be crack public defense subcommittee on the status of the guided missile program—which is not the nameplate of Sen. Stuart Symington (D-Mo.)—to open hearings before a special committee on U.S. aerospace is created. Both House and Senate are holding back now, pending hearing issues with Defense Department officials. Chairman George Mahon (D-Tex.) of the Defense Appropriations Subcommittee has announced that his joint concern at executive session on the defense budget, now underway,

is the "possibility" of Soviet superiority over the U.S. in guided missiles. The Joint Atomic Energy Military Applications Subcommittee, headed by Sen. Harry Jackson (D-Wash.), is continuing to ride herd on guided missiles with executive budget issues.

The outcome of the Symington accommodation debate is substantial because it is the first measure before the Senate Armed Services Committee, which will shape sharply. The Senate Disarmament Subcommittee, headed by Sen. Hubert Humphrey (D-Minn.), is also shaping this country's position on guided missiles on the ground that the Air appears in agreement in knowledge of the military position of the world powers.

Improving Aircraft Procurement

J. S. McDowell, president of McDowell Aircraft Co., has backed down on his offer to make recommendations regarding aircraft procurement to be presented to the Bureau of Aeronautics and a House Government Operations Subcommittee headed by Rep. Cliff Hollister (D-Calif.). McDowell made the offer during the subcommittee's hearings last fall on the costly and delayed FH-101 aircraft built by McDowell and powered with Wrightsbourg's Da N-10 engine. (AW Oct. 1, p. 12)

McDowell has informed Hollister and the subcommittee:

"The deeper we get into it . . . the less competent we feel to improve the Government procurement process without making an extensive independent study. That, we realize, may have gradually led us to the point here that the staff to do it, and we find our team will be much better spent . . . by concentrating on our own plant or trying to do a better job in every way on these intricate combat aircraft systems. This we are reluctantly doing."

Civil-Military Defense Department?

The drive in Congress to make Civil Defense Administration a part of the Department of Defense stalled again. Sen. Dixie A. Gothic (R-N.M.) and the Joint Chiefs of Staff and a professor of physics at Massachusetts Institute of Technology. In Congressional hearings he stressed the intertwined nature of military and civil defense and private and civil defense.

Other points developed in his testimony were:

- "Do think more funds are needed for our overall defense strength . . . we were so much about doing the wrong thing and not enough about getting on with the job."

Generally there is no need for research and little need for development for any early warning system (EWS) effective against aircraft.

* * * New there is another threat facing the transcontinental ballistic missile. This requires a great deal of research and development. An early warning system being called 33 was.

* Asked by Rep. Danio Fasen (D-Fla.) if the EWS is not obsolescent because it will soon be possible to build a "vertical" missile, Gothic replied: "To see 2,000 miles you would have to go up 600 or 500 miles. The practical methods to do this would be short or big at the Pentagon."

—Washington staff

Precision lubrication of tiny bearings assures dependable operation of G-E aircraft motors

The drop of oil on the hypoflomerite needle above could represent the difference between aircraft motor failure and dependable operation. That's why defined G-E aircraft motor engineers make sure that ball bearings on G-E aircraft motors are lubricated with just the right amount of oil—right to the last drop.

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Special lubricants like just one of the many extra design features standard on G-E aircraft motors. Others include Mylar® in insulation, newly developed Alfonex® wire, nickel bushings, stainless steel shielded protection against radio interference, and much, much, more.

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Gardner Quits, Starts USAF R&D Fight

Research chief's resignation forces issue of need for funds to keep pace with Red technical progress.

By Robert Hatz

Washington—A major battle over the future pace and scope of Air Force technological program began here last week, with the resignation of Tovis Gardner as Assistant USAF Secretary for Research and Development.

Gardner made it clear he disagreed because the current funds allotted to USAF for research and development were inadequate to match or surpass the mounting pace of Russian technical development in aviation and on land.

In the wake of the Gardner resignations the following key points emerged:

- USAF Secretary Donald Quarles early rejected a request for a \$34 million boost in USAF research and development funds, which was backed by all the top civil and military technological experts at the Air Force. In addition to Gardner this broad band was supported by Dr Theodore von Kármán, senior civilian scientist, Brig. Gen. Charles A. Leidleberg, general whose USAF team on technical behalfs the USAF Director of Research, Col. Donald L. Pratt, Deputy USAF Chief of Staff for Development and Lt. Gen. Thomas Power, chief of the Air Research and Development Command.

- USAF is preparing to cancel many of its current research and development programs and will be unable to organize any programs in critical fields because of lack of funds included in the current program to be canceled as the budgetary aftermath of the long-term and relatively new裁減 (cutback).

- USAF Secretary Quarles also rebuffed Air Force pressure to expand a third nuclear-powered aircraft project that would explore a new approach not being covered by the two current General Electric Co. and Pratt & Whitney Aircraft programs.



TOVIS GARDNER

Air Force and Navy have moved substantial boosts in their missile development funds recently from Defense Department aerospace funds but USAF has been given only a small token allocation from the \$239 million fund.

- USAF missile development programs proceeded at a highly accelerated pace, but still far behind that of Soviet power, and in some areas results in unbroken time. Gardner had a "crash" type program in high gear.

- President Eisenhower and the USAF situation is being remedied and developed as rapidly as it can be done in that measure, so far as its experts and the people in the Defense Department tell me." Without mentioning the Gardner resignations, he held his weekly press conference. "In certain fields we are way ahead of the Soviets, in others we are way behind them. In most fields I think there are probably about 50% of all those that are limited fields in a great big field. I think, overall, we have no reason to believe that we are not draggin' everything that liaison, science and brains and resources can do to keep our

position in a proper posture."

The President and his joint chiefs here have raised several times that the guidance program must be kept up over any other in the Defense Department," he said. "There are leads to what you can do in research and development . . . There are only so many scientists, there are only so many choices you can pursue, and, indeed, one of the things you have to watch in this—isn't it to develop too many at once or you get in each other's way and you block them all through the confusion and the demands you make on the scientific push and every other kind of lead that you have in this whole field?"

Championed R & D

Gardner used it clear in his press conference announcing his resignation that Secretary Quarles had rejected the proposed Fiscal 1958 and 1957 research and development fund increases and that he "had differences of opinion" with Quarles rather than with Defense Secretary Charles E. Wilson. Less than eight months ago Gardner, along with other champions of a strong aerospace research and development program, including Defense Appropriations Committee Chairman George H. Mahon, urged Quarles to increase the Air Force's share of the defense budget. Just weeks ago Quarles continued to emphasize the need for increased research and development effort to meet the many challenges of Soviet technology.

Quarles said, as to whether he felt the security of the country was at issue in the research and development programs, "I am concerned about our rate of technical progress on weapons, to the rate of progress of our potential enemy in these countries. It is the rate of progress that is the primary concern."

Support of Scientists

Gardner indicated that a large portion of the scientists engaged in active work on defense research and development shared his opinion on the inadequacy of the current aerospace research and development programs.

He said, "The scientists who would spend the rest of their lives on many of USAF's current development programs—Gardner and he had made his position on the inadequacy of USAF research and development funds clear to Congress during the Fiscal 1958 budget hearings a year ago, and that he had resigned now only because Quarles would not support this position."

He said he had not been offered the new post of Defense Department aerospace "counsel" but he said creation of the post was a good idea if "someone felt

ANAVATION WEEK, February 21, 1958

Conflict of Interest

Strategic Petroleum Investigating Subcommittee staff questioned Tovis Gardner, USAF Assistant Secretary for Research and Development, for several hours Feb. 6 to investigate whether a conflict of interest might exist between him and his former employer, the private business interests and his knowledge there was no conflict of interest with his USAF post.

It had sufficient authority". The industrial branch of Defense Department research and development agency and scientific talent is being depleted by having a duplicate missile program in each of the three services.

Gardner will be pleased to stay in the Pentagon until he has finished a report on the present status of the aerospace and missile development programs, and on what could be done to accelerate them, for Secretary Wilson. After that he plans to take a short vacation.

Gardner reflected his opposition in a letter to President Eisenhower in Feb. 3. It was sent through official channels but it was stopped by Secretary Quarles, who persuaded Secretary Wilson in attempt to talk Gardner out of resigning. Gardner spent two days in Miami with Wilson where heavy pressure was applied to persuade him to withdraw his resignation until after the Fiscal 1957 military budget was approved.

Gardner said in his letter to the President that the USAF budget "is a dead duck" and that it could be killed entirely by the President. In view of its highly critical nature it appears doubtful that the president will risk it public.

Gardner will be called to testify before at least two Senate committees, Sen. Harry Jackson (D-Wash.) as requested Gardner to testify before his military subcommittee of the Joint Congressional Atomic Energy Committee and Sen. Everett Scheltz (R-Minn.) and Gardner would appear before the Senate Appropriations Military Subcommittee.

Small Defense Plants Oppose Renegotiations

Los Angeles-San Diego Industrial Area Am. Inst. 97% of its members oppose renegotiation and the other 5% want some changes made to the contract for opposition, said one to STDS, as follows:

- Continue the spirit of principle.
- Tend to increase the net cost of Government procurement.
- Be the most sensitive deterrent to economic subversives.
- Have hospitable borders on small business.

ANAVATION WEEK, February 21, 1958

Change in Quarles' Thinking Seen In Emphasis on Skilled Personnel

By Claude Witzel

Washington—USAF Secretary Donald Quarles believes air power proponents today are over-emphasizing the importance of improved weapon systems.

He also is confident that the skill of USAF officers and men in the use of today's weapons survives even the potential shift of their counterparts in other nations.

The Secretary, himself a manager and former chief of the Defense Department's research and development, made these plain statements last week in addressing the 1958 Annual Meeting of Congressmen.

By coincidence, the speech was made on the same day that Trevor Gorick, USAF Assistant Secretary for Research and Development, announced he is arranging battles of a basic conflict with Secretary Quarles. The conflict is centered on Quarles' contention that a crash program is necessary to win the missile race with Russia.

In his own address, Quarles came quickly to the issue of his disagreement with air power proponents by his brief refutation of the findings of the proposed Fiscal 1957 USAF budget.

No Reason to Complain

"Our Army today enjoys statements regarding the number of bombers in the Commonwealth as never," he declared. The public is often advised to believe that if the Communists could win an element of the hardware associated with an air force, it is lost."

Quarles then pointed out that the Communists have a vastly different air defense requirement than the U.S., and that in this category there is no competition to compare our air capability with theirs.

The Air Force Secretary concluded by listing all the elements that go to make up air power and by declaring again that "there is a decided advantage to greater emphasis on the hardware element."

The Secretary and USAF's skilled staff "is not only without parallel in the world today, but it is not even approached."

"They will never be, however, a group of air force leaders who possess the kind of expertise in the basic principles of power in war independent to that of the leaders of the United States Air Force, unless there is another great war."

"This shift in the employment of air power, the experience, the sure knowl-



DONALD A. QUARLES

edge, is one of the great elements of our U.S. Air Force capability which no other air force can possibly inherit."

Secretary Quarles then came to a point in his Air Force philosophy that occurs an obvious solution to his refusal to support Gorick in the fight for more R & D funds.

He said the staff of USAF's London "is one of the great factors of our air power strength that will remain with us for many years to come regardless of technological development."

Thus the Secretary said, is why he has so much confidence in the deterrent power of USAF.

"In spite of all we hear about the danger of not losing the technological race," he declared in an almost-direct reference to Gorick's strong stand, "we are constantly aware continue to hold our own in the technological race." He added that any technological development now conceived could split our very briefly built deterrent position, causing of course that we goes ahead with our own program."

Better Views

The expansion by Quarles in his London office was viewed by some as an unacceptable change from some of his previous statements on the necessity for maintaining American leadership in the quality of weapon systems.

On January 26 last Nov. 18 he told an American Writers Assn. in Washington that "surgeon and engineer research in airpower—and missile power" is essential. He warned at that time: "The country which lets its confi-

Gardner's Statement

I have put some very constructive meetings with Secretary Wilson at Miami and in a result of these meetings he has asked for a special report on things which used to show about the research and development programs and guided missiles. I will submit myself to preparing this report for Secretary Wilson and Secretary Quarles in the next six months.

Because of an honest difference of opinion about the importance and scope of the Air Force research and development and guided missile programs in relation to the threat, I have submitted my resignation to the President through Secretary Quarles and Secretary Wilson. I expect it to be acted upon within the next few days.

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decent option its equipment, will be in danger of becoming a dead country."

Two months earlier, on a television program, the Secretary indicated that he believed USAF must have a strong and continued K-d-E program to support the Air Force.

Quinton's report itself attested toward the vital importance of USAF's R & D effort was perplexing in view of his background and the fact that he was chosen for his job soon after the technological race learned it was crucial one for the United States.

New Grumman SA-16B Undergoes USAF Test

A longer range fighter Grumman Albatross aircraft prototype developed by the SA-16B is being evaluated by the U. S. Air Force at Orlando AFB, Fla.

The SA-16 has a 16.5 ft longer wing span than the current SA-16A 80 ft. span.

Confined leading edge replaces wing tip slots for improved control at low speeds and at higher angles of attack. Albatross are larger and a ground rib arrangement reduces control forces required.

Tail surfaces are larger to provide better stability and control. A blowout fairing covers some of the tail surfaces during landing.

Other alterations are located in the wings. Rear position High-pressure drooping boots on the wing and tail extend and contract more rapidly to speed ice removal. The modified Albatross weighs a half ton more than the SA-16A.



Turboprop Constellation Tests

One speed of 479 mph at maximum gross weight of 166,400 lb. has been recorded during flight testing of the Navy RTV-2 turboprop version of Lockheed's Super Constellation. The transport in nose-down attitude (tail-up) was moving from a roll. USAF wants to get all four turboprop Constellations with Pratt & Whitney T36 engines and the Navy's two RTV-2s with PWW T34-40s to speed subsonic transport operations at Keflavik AB. Gross weight is half ton more than the SA-16A.



AVIATION WEEK, February 12, 1968

Jet Age Conference:

Noise Problem to Get Worse, Not Better

Washington—Adams' battle of the decibels is going to get worse before it gets better.

This is the simple conclusion of a two-day Air Age Conference here, attended by more than 1,500 persons with a vested interest in the meaning of aircraft noise.

The meeting was sponsored by the Air Force Association to spur action before an rate efficient interests analyze with the nation's defense and progress in air transportation.

Guests heard about three ways to attack the noise problem, none of them new to application of the military and defense:

- + They can still noise, reducing the public to tolerate it in the interest of national defense and technological progress.

- + They can English noise through increased range.

- + They can move the noise away from the public, isolating replace from the people who protest against them.

USA Opposes Silencers

In general the attitude of U. S. Air Force spokesman is that they will put their hopes on the first and last choice. The authors, more concerned with public good will and proximity to their customers, hope the engineers will solve the problem by mechanical means.

Gen. Nathan F. Twining, USAF Chief of Staff, says "We're not headed toward silencers."

The general complained that silencers developed to fit small performance of military fighters and bombers. Gen. Twining's great hope is in better community solutions which "at least make the season for noise a little more understandable."

He continued:

"Now I put something we are going to have to live with. The American people will eventually understand this. We want do it so far as to speed this understanding." The general also anticipates that the public will accept the undesirable hypothesis of living just as it has learned to accept some hypotheses of the undesirable, such as floods, noise, expense, death and destruction.

Gen. Twining received strong support for the military viewpoint from Gen. Earle E. Partridge, chief of the Continental Air Defense Command. Stressing the importance of jet flying to national defense, Gen. Partridge discussed the benefits of trying to move bases away from communities.

Real estate developments, he pointed

out, have a way of following the Air Force.

The Air Defense Command has a public relations campaign and it tries to be as quiet as possible, but it still has many visitors. One flight of the visitors last year—16 in all—located on civil airports. The Air Force wants at least 9,000 feet of runway but does not have it at a majority of the bases.

Longer Fields Needed

And, says Gen. Partridge, "We are going to manpower and limited acreage because of the short fields from which we operate."

The perfect field, he says, would have a 16,000-foot runway for single engine planes and 12,000 feet for multi-engine planes. The aircraft over the length of 171 miles.

The Air Defense Command is trying to get new fields that would be 12 miles from the nearest large community, with approach and take-off corridor seven miles long and four miles wide.

On the subject of improved aircraft performance through short take-off and landing capabilities, Gen. Twining emphasized the great optimism.

All of this, he said, "will alleviate the public's problem, which they will get up to a point where they realize it is easier to stay away from communities. Like all new developments, they will probably bring us new problems we haven't even imagined yet."

Mufflers Supported

Dr. Hugh L. Dryden, director of the National Advisory Committee for Aeronautics, supported

MIG-15s for Argentina?

Buenos Aires—The Soviet Union has offered to sell Argentina an undisclosed number of military aircraft, including MIG-15s and heavy bombers, according to a spokesman for the Ministry of Aviation.

Unofficial sources reported that the Soviet aircraft price is less than the rest of the world received—approximately \$100,000 less. In Argentine officials every day expect to hear Argentina offend every Soviet Block Soviet jet fighters they already have expressed interest in. The proposal also would provide long-term payments, primarily in the form of raw materials.

Others discussed new types of high performance explosives and said we need them in both military and civil aviation.

Airline representatives and aircraft manufacturers at the meeting differed from the military viewpoint with their insistence that increasing jet noise cannot be done to much increase jet engine noise.

Most outspoken proponent of this view was William Littlewood, vice president of American Airlines, who said Boeing jet planes are older and is laying plans to use them from existing airports.

In addition to the community problem, Littlewood cited the fact that airline maintenance personnel won't work alongside jet engines. The noise the engines make, he said, tends to kept within the limits of human endurance.

Boeing spokesman at the conference maintained its support program on the development of a more responsive design to control the音量 of their aircraft's J-37 engines. Littlewood said he does not believe the smaller will cut efficiency of the Boeing plane more than 1%.

Defending Aircraft To Get A-Weapons

Washington—U. S. Air Force is preparing to add aircraft of the Continental Air Defense Command with atomic weapons and antiaircraft division for a new public relations campaign to assure the American people that no harm is involved.

Speaking at the Air Force Association's Jet Age Conference here last week, two top USAF officers made their statements:

- Gen. Earle E. Partridge, Commander of the Continental Air Defense Command and

- There are high explosive storage facilities in our country now, and the day is not far off when we shall have atomic weapons at the various stations in storage and on the planes is flying."

- Gen. Nathan F. Twining, USAF Chief of Staff, said, "It is only common sense that whatever weapons our Air Force has can be made available. Just as modern man uses survival." This was interpreted to mean that nuclear weapons are carried by Strategic Air Command bombers on training missions.

- Gen. Partridge said that his fighters interceptors are always loaded when on maneuvers. The weapons, he added, un-



F-100D, Super Sabre Fighter Bomber

North American's F-100D, first USAF fighter-bomber capable of supersonic speeds at level flight, is shown above on its initial test flight from North America's Los Angeles Airport. The F-100D externally similar to earlier Super Sabre models, is equipped with a Minneapolis-Honeywell autopilot and incorporates a number of other improvements to fit it for fighter-bomber assignment.

clude full manner of control sequences . . . to see them and we are putting especially humans into the controls for the future. The reason is that the present weapons are only insights in comparison to what we are going to have."

The general said this situation contributes to the command's determination to remove its operations from unsupervised or civil airports as soon as possible.

Gen. Twining promised that military steps will be taken to eliminate the possibility of an accidental downing of the aircraft by ground troops. "We are in the process of ordering禁令 to Adelphi, a relatively less dangerous than many other options," he said.

"It is not," he added, "and will not be a major problem to conduct these actions at safety."

The Chief of Staff pointed out that the arrival of nuclear-powered engines will invoke no greater danger in the public than conventional planes. He said some special problems will result, but USAF is anticipating them and conducting tests by buying a nuclear reactor in a B-52 and flight test of it at Wright-Patterson.

Gen. Twining anticipated that nuclear flight will be less hazardous than conventional flight, with engine failure "almost non-existent."

USAF Wants Industry to Design Jet Executive Transport-Trainer

Washington—The Air Research and Development Command will soon ask the aircraft industry to design and build a small jet transport which would readily double as a combat proficiency trainer.

A General Operating Requirement (GOR) for such an aircraft was drawn up recently by the USAF and ARDC in a joint industry presentation.

What USAF has in mind is an aircraft with these characteristics:

- Six to eight passengers

- Speed of at least 400 knots

- Range of 1,000 mi., or better.

The aircraft would replace the C-46, B-35 and C-47s now used as military executive transports and as proficiency trainers for headquarters personnel.

To oblige that the new aircraft would be a waste of taxpayer money considering the large number (about 10,000 each) of the old aircraft in the inventory, USAF will insist that the aircraft will not less to produce than the cost of maintaining the old.

Properly, manufacturers have to resort to producing replacement parts, an expensive proposition. Operating costs

should be high for maintenance personnel and fuel.

Most important is the growing problem of keeping its combat leaders trained for jet operations. Officers assigned to headquarters find it almost impossible to get in jet flying time. "We need to fly the planes as much as jets can use one experienced combat commander," said Col. Donald G. Johnson, chief of the flight test division. "For the stated purposes of an E-4B with an increased program in flight planning and operation."

Another claim that he could quite easily prove to congressional committees is that more budget for combat proficiency training is a "total waste." He says jets don't have to remain immobile to practice combat tactics, and the increasing need for base new scientific information to maintain a rapid pace of technological development.

Design of the small transport has been cited by the program as small engines like Fauchald's J44 and Con-turbine's J95. Early USAF experiments fail for a transonic aircraft which, it is hoped, would be attractive to the business firm.

Convair Creates Basic Research Organization Under Critchfield

San Diego.—New pattern for waging basic research into the development structure of an aircraft organization has been organized by the Convair Division of General Dynamics Corp.

With the appointment of the General Dynamics board of directors at their usual meeting, Convair will establish a basic research organization headed by Dr. Charles Critchfield, who has been Convair's director of scientific research since last April.

Basic principle on which the new Convair research group will be organized is a clear and distinct separation of basic research activities from the demands of product development and engineering. The relationship of scientist, engineer and management in aircraft and missile firms has been a source of considerable friction during recent years.

The Convair basic research program will consist of three parts:

- Establish a basic research laboratory led by five senior research scientists in fields related to aircraft and missile technology. Convair will aim at initial level at a science interest in each of the following fields: gas dynamics, solid state physical chemistry, fatigue and impact loads, metallurgy, non-destructive testing, flow in structural aerodynamics, and electromagnetic induction in short pulse phenomena.

Second basic research proposals by Convair engineers who have an inclination to implement their engineering work with regard of some specific research problem.

- Give financial support to research projects by academic or other scientific institutions that are in fields related to future aircraft and missile technology.

Scientist's Importance

Convair will begin its basic research program in a budget of about \$500,000 for the first year, increasing after that to an annual expenditure of about \$100,000.

Critchfield's move is another indication of the growing role of the scientist in the expansion of the aircraft industry, and the increasing need for basic new scientific information to maintain a rapid pace of technological development.

Critchfield's new arrangement follows its scientist research program will be an aid in understanding and improving the division's competitive position in the era of rapid technical advance in the following areas:

- Provide fundamental knowledge necessary for the conception, design and

for engineers with research training or graduate scientists who have gone into the applied field.

"In either case," Dr. Critchfield explained, "if a man wishes to pursue a problem beyond limits that are considered allowable by management engineering standards, that man must be supported by his company, they at Convair, and under no technical direction. This provision allows for a very important class of individual, namely the man who for the most part, wishes to create or invent something but occasionally wishes to explore the basic meaning of his own invention."

Public Affairs Post Goes to Philip Allen

Washington—Philip K. Allen, who has been acting as Deputy Assistant Secretary of Defense for Public Affairs since the resignation of B. Kerri Hause, has been given a permanent appointment to the post.

Most recently an Executive Assistant to Robert Trapp Bass, Assistant Secretary for Legislative and Public Affairs, Allen is a Republican who came to Washington in 1953 to be chief clerk of the Senate Armed Services Committee.

In his new position he will be responsible for Defense Department press relations and will be in charge of the Office of Security Reviews.

He has previously worked for the Massachusetts State Auditor, the Massachusetts State Auditor, and a term in the Massachusetts Legislature, where he was chairman of the Agricultural Committee and served on the committees on pensions, old age assistance, town and education. For two years he was executive secretary of the Massachusetts Republican State committee.

Purge Mat Designed To Protect Fuel Tanks

Thielert Aircraft Co has designed and installed a purge mat system in a Lockheed T-33A jet trainer under contract to the Air Research and Development Command. The system is designed to protect the aircraft's fuel tanks from secondary contamination.

The anti-contamination consists of 330 rubber bags, inflated with an inert gas, placed around the plane's rubber fuel cells in the wings and fuselage. The gas bags can be blown from two control points on the aircraft. They add 30 pounds to the plane's weight.

The purge mat was developed by Goodyear Tire and Rubber Co. They were installed at the T-33A because the trainer resembles typical combat jets



DR. CHARLES CRITCHFIELD

responsible for future products as soon as possible.

- Attract and retain personnel of high technical qualification and ability.
- Enhance the reputation of Convair among potential customers as a capable and forward looking organization.

Proposed Future Schedule

Dr. Critchfield, who has worked with the Atlantic Electric Generating Co's Los Alamos laboratory, engaged in high altitude cosmic ray research and had an academic career in mathematics at Harvard, Massachusetts and George Washington universities, believes the success of the basic research organization lies within a corporate structure well designed so how effectively its personnel can do their job. He also believes the demand of applied organizations which still maintain working close liaison with engineers working on problems in their basic fields.

"Our basic researchers and their staff will not be subject to demand for the purpose of engineering projects," Dr. Critchfield told AVIATION WEEK. "They will be available only by personal choice and without preceptor from management. They will have the powers of providing technical consultation in unfamiliar fields or providing profit social meetings to other consultants, or possibly starting a refereed journal of new toward the problems at hand."

In producing research orders for Convair engineers who are involved in that direction, Dr. Critchfield is looking

is the design of a helicopter "several times larger than my helicopter now flying with production status. The largest helicopter flying at the present time is the Pascack Helicopter Corp's YH-16.

Pascack Aircraft says it also intends to develop its a "priority product" a new VTOL aircraft of "superior design." It sped the prospectus says, will be leased only by the power unit, and thus this type of VTOL aircraft will be expensive.

Other Projects Planned

Other Pascack Aircraft projects include development of a load for training space for the Bellanca. Another project is a cargo plane in the working design developed by Pascack Helicopter under contract from the U.S. Navy, for manufacturing.

The next company she contemplates work on a helicopter door and sub-contracting from other aircraft manufacturers.

The Pascack Aircraft prospectus points out that in addition to Frank Pascack the young company has on its staff three of the top designers at spacious at least in part for new ideas produced by Pascack Helicopter from 1943 to 1955.

Frank A. Arnoff's balance sheet shows that in addition to his PHC stock, worth about \$136,675 in cash and \$15,352 in equipment, of which about \$6,000 is represented by machinery and fixtures.

Vickers Lists Benefits Of Hydraulic Systems

Deutsche-Vicker Inc., a major manufacturer of military and commercial industrial systems and components, listed three advantages for hydraulic systems over conventional steels during an recent symposium here on jet engine controls.

They are:

- Lower costs on engine thrust and specific fuel consumption.
- Quick, powerful retraction.
- Equal or better reliability.

The lower drain on engine performance is due to removing mechanical power to drive the hydraulic system from the turbine shaft, either from operating the thermal cycle or bypassing the compressor.

Retraction problems are automated with the high temperatures that can be expected in high Mach number flight.

With fluid temperatures of 600 to 1000, even the best of the present high temperature synthetic fluids are good only for limited life. Even more critical are the levels of pump and actuator seals.

USAF Defends 'Active' Tool Plan Before Small Business Committee

Washington—The Air Force defended its new industrial modernization program of "active" tools and techniques instead of "reserve" as testimony before the Senate Small Business Committee.

It is a reversal of the policy worked out in 1952 by the Advisory Committee on Production Equipment, headed by Horatio S. Vincent. The Vincent policy proposed that "reserve" production capacity be held in being for defense purposes, and "active" for the manufacture of aircraft and other military hardware. In the present extent practicable, and called for a machine tool purchasing program of \$300 million annually.

Vance, who was president of Statebaker Precision Corp before heading up the advance group and is now an Atomic Energy Commissioner, argued that the so-called "Vance plan" is now outmoded. He supported the new USAF plan.

The main point in the new approach:

- Increased emphasis is put on the quality and quantity of aircraft and aircraft and other highly technical machines in being.
- Advanced production facilities will be quickly introduced into normal production.
- "Active base packages" will be stand an active production facilities.
- Reproductions will be made for withdrawals from those surplus lines into current production. This will be examined mainly for adequacy.

Vance told the committee that his 1952 plan was based on the assumption that the Air Force would have substantially less time for preparation than in World War II or the Korean war and that, therefore, there should be an industrial mobilization being in being.

"But technological advances, particularly in aircraft and aircraft, have changed that," Vance continued. "The decision of war will now be made by the military authorities on hand. The quality should be the very best, and first, is less, and that assumption should be put into effect if possible."

Assistant Secretary of the Air Force for Material, DeLoach C. Sharp, announced that AF's new "hot and dry" instead of "hot and steam"—machines program is detailed in the prospectus to match both an atomic war "or" a Korean-type emergency. He said:

"This new policy is based on the premise that, for the first time in history, our nation is faced

with a continuing potential threat of devastating destruction at the onset of general war. That, so far as the Air Force mission are concerned, the possibility of a full-scale war or attrition with a prolonged existence productive building up is imminent, if not eliminated. The decisive phase of a full-scale war will be intense attrition, and assets for combat must be on hand or available immediately."

Consequently, it is probable that least acute emergency situations, without domestic industrial damage, will arise which require accelerated production of some selected armories. To make that policy into a meaningful program requires that production sources have proper equipment as hand to meet current schedules and selected sources have capacity which, through the addition of material and manpower will permit accelerated production."

Sharp also anticipated that savings resulting from the introduction of new basic production methods and the increased efficiency in current production would substantially defuse cost.

The committee's hearings were opened over the fact that AF has attained its \$34 million allocation for production facilities for fiscal 1955 to the Treasury Department. In addition, Defense Department has taken the \$100 million allocation for the three years for fiscal 1956.

Sharp explained that AF anticipated the \$44 million because it was designed for a much smaller total production. He said that AF had directed \$60 million from surplus procurement funds for tools that could be used in current production, as well as in new policies. Air Force is now making a comparative study to determine an additional production facilities requirement.

Bendix Names Scientists To Systems Planning Unit

Bendix Radio Avionics Corp. has appointed scientists and engineers to its Systems Planning Council, a new section of management which will coordinate development of future versions of electronic equipment such as electronic steering, communications, and control devices.

Karl F. Kellerman was named scientific director and Charles A. Sharp is director of advanced systems. James W. McNabb, Louis B. Young and R. E. Geleke were assigned staff capacities, and Prof. Robert F. Roachert of Case Institute of Technology is the consultant.

Here's another

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SPECIFICATIONS—

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The performance record of the Gilfillan GCA Quadradar is due to its 40-mile approach coverage giving altitude, azimuth and range position on jet aircraft straight-in penetration approach from 20,000 feet and 27 miles to touchdown.

In military performance tests with Quadradar, substantial time and fuel savings were made in landing jet aircraft. Three examples are given at right.

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- Height Finder
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F-84

Quadradar improved in F-84 jet fighters on 2000 lbs. fuel compared to 800 lbs. fuel required for visual instrument landing with time saving of 47.98 minutes for each approach.



T-33

Straight in T-33 approaches as Quadradar required 2 minutes, 45 seconds compared and only 150 lbs. fuel compared to 500 lbs. on a normal instrument approach.



B-47

A flight of seventeen B-47's was brought in Quadradar in less than half the landing time required by conventional instruments without prior experience. This represented a fuel saving of 7000 lbs. for each B-47.



INFLATED AND FLYING—Pioneer of Miller plane in biplane: 40 hp. motor.



PARTIALLY DEFLATED—Wing and tail members fold out inflated and secure.

Goodyear Tests Rubber Airplane

Experimental inflatable rubber airplane developed at Goodyear Aircraft Corp. has made its first flights at Wang foot Lake Airfield, Akron. The lightweight, single-seat, pusher monoplane was designed to test the possibilities of Goodyear's Airstat as a structural material. The aircraft, for now Office of Naval Research is interested in the project.

The wing, tail members and pilot's seat are made of Airstat, which consists basically of joined layers of inflatable rubberized cotton fabric. The fuselage is made of sandbag fabric. Powerplant is a two-cylinder, 40 hp. motor, mounted on a rubber support above the fuselage and directly behind the wing. Metal supports also connect the wheels and pilot's seat with the fuselage. Struts, supports and other members are attached with high strength

patches of rubberized material. Goodyear says that the craft, believed to be the first of its type in this country, is pumped up with low pressure from that required to inflate a passenger car tire.

A two-seat utility plane with rubberized wings, developed at Goodyear

in the M. L. Johnson Co., has been ordered by the Ministry of Supply (AW Aug. 28, 1953, p. 7).

Seaboard's Atlantic Freight Gains 33%

A record 5,327,300 pounds of trans-Pacific air freight, some 33% higher than in 1954, was carried last year by Seaboard and Western Airlines. The high season in Nassau coincides with the heavy winter freight traffic generated by Eastern and National. Thus, operation of a Nassau route balances with Pan American's operating pattern better than it would with those of National or Eastern.

Rubio feels that the route will not

be a success in the Arctic area. Seaboard's total freight figure for 1953 are 67% higher than 1954.

The carrier's fleet of Super Constellations and DC-4s made 1,524 ocean crossings during 1955, logging 37,745,300 revenue flight miles in 10,451 hours. Also, during the year, Seaboard became the first U.S. consolidated air carrier to provide air cargo service between New York and Paris in Western Europe and the Far East.

To keep up with its market growth, Seaboard has placed orders for five more Super Constellations, with delivery beginning next December. The airline also appointed Baker Export Agency, Inc. as general U.S. sales agent.

Incomes in shipments of household goods, search and rescue parts and electrical equipment were recorded ashore on the Athens route. Westbound auto parts, clocks and watches, machinery parts, lenses and embossers were in greater volume.

PanAm is Favored For Nassau Route

Washington-Pan American World Airways has been chosen as the American airline to compete with British Overseas Airways Corp. for New York-Nassau traffic by Civil Aeronautics Board controller Merritt Bakles.

The executive issued a five year certificate for Pan American on the route to the Bahamas with a provision which would rule out any subsidy for the service.

In the New York-Nassau route, CAB will choose a U.S. flag carrier to offer a competing service on the route now operated by BOAC. Presently for an American carrier would be an annual route made from Atlanta to the Bahama air agreement between the United States and the United Kingdom.

Rubio chose Pan American because

of operating economics sensible which wouldn't apply to either Eastern Air Lines or National Airlines, two other applicants for the route. He said that there is little difference between the two companies in their benefits to the traveling public are concerned.

In his report, the committee points out that the peak season for tourist travel to Nassau is from December to April, while Pan American's peak traffic demands on the Atlantic are between May and October. The high season in Nassau coincides with the heavy winter freight traffic generated by Eastern and National. Thus, operation of a Nassau route balances with Pan American's operating pattern better than it would with those of National or Eastern.

Rubio feels that the route will not



Not coffee...But I
sang...and had
plenty of time.
But No, it's not
that it is to be
seen as the
service you Gamma
Buffet girls demonstrate.

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Trans usage... requires that your buffets and connectors be of highest quality, strength, reliability and safety. Cannon Buffet Units are specifically built to stand the test... to give long, dependable service.

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Voltage of 110, 220, 240, 250, 270, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480, 500, 520, 540, 560, 580, 600, 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860, 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1160, 1180, 1200, 1220, 1240, 1260, 1280, 1300, 1320, 1340, 1360, 1380, 1400, 1420, 1440, 1460, 1480, 1500, 1520, 1540, 1560, 1580, 1600, 1620, 1640, 1660, 1680, 1700, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980, 2000, 2020, 2040, 2060, 2080, 2100, 2120, 2140, 2160, 2180, 2200, 2220, 2240, 2260, 2280, 2300, 2320, 2340, 2360, 2380, 2400, 2420, 2440, 2460, 2480, 2500, 2520, 2540, 2560, 2580, 2600, 2620, 2640, 2660, 2680, 2700, 2720, 2740, 2760, 2780, 2800, 2820, 2840, 2860, 2880, 2900, 2920, 2940, 2960, 2980, 3000, 3020, 3040, 3060, 3080, 3100, 3120, 3140, 3160, 3180, 3200, 3220, 3240, 3260, 3280, 3300, 3320, 3340, 3360, 3380, 3400, 3420, 3440, 3460, 3480, 3500, 3520, 3540, 3560, 3580, 3600, 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Air Marker Increase Puts Total at 10,000

Washington—An additional 2,147 air markers were ratified in the U.S. during 1953, bringing the total to 18,050.

The increase in the number of pilot aids was due largely to air marking programs by state aviation agencies with grants by groups including the Boy Scouts, Chamber of Commerce, the 99s—an organization of women pilots—and the Standard Oil Co. of California, which has a permanent air marking program for 375 markers in eight western states.

Vigorous reported the most markers installed last year, with 266 followed by 230 in Florida, 200 in Ohio, 184 in New York, and 153 each in South Carolina and Louisiana.

In all, 37 states took part in air marking programs in 1953. Several other states were in the off year of established programs to install markers every other year.

New York State added a first air marker last year with the installation of 17 markers on tall buildings along the state's seacoast.

The standard air marker, developed by the Civil Aeronautics Administration and accepted by the International Civil Aviation Organization, is painted on steel tags or towers in 10 foot letters of chrome yellow on a dark background.

The names of the towns, an arrow pointing to the nearest airport and a figure giving distance are included.

FARE EXTENSION ASKED

Twa World Airlines has asked the Civil Aeronautics Board to extend its \$50 transcontinental coach fare until next September.

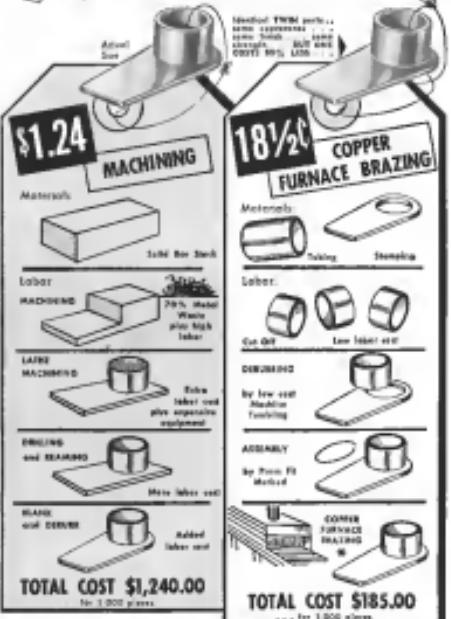
TWA says that the \$50 fare is distinctly responsible for 60% increase in transcontinental tourist traffic. In the fourth quarter of 1953, the airline reports that air travel level between the East Coast and California increased 58.9% over the same period in 1952.

The \$50 tariff, which is also offered by American Airlines and United Air Lines, is proposed in March. TWA is asking CAB permission to continue the tariff for six months.

The low coach fare was first proposed by TWA last August. It was approved by the CAB and became effective Sept. 12. Highest tariffs filed by American and United were also approved. The tariff specifies a \$100 roundtrip fare for travel between high density ports on the East and West Coasts. To take advantage of the fare, the traveler must fly between Monday and Thursday and must complete his trip within forty days.

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CAB Examiner Favors New Route for Ozark

Washington—A new local service route for Ozark Air Lines between Parsons, Okla., and Des Moines, Iowa, has been recommended by Civil Aeronautics Board examiner W. W. Bryan.

Bryan's report to the examiner's agent for Ozark between Des Moines and Parsons via Burlington and Ottumwa, Iowa, is an indefinite proposal. He finds no need for service at Galveston, Tex., or Des Moines.

While Ozark serves the new route, the examiner would suspend service by Braniff Airlines at Burlington and Ottumwa.

The examiner's report recommended that the route of service to Mt. Dodge, Iowa, and the duration of Ozark's new authority be deferred for decision in the Seven States area investigation. The Seven States case is a new proceeding now under way, having been opened in 1952 with initial status.

Bryan said "It seems clear that the need for air service between Des Moines and Parsons is a local one that can be satisfied to a better extent by a local or carrier dedicated to serving the local roads than by a local carrier that must devote its efforts to the long-haul traffic."

Referring to competition by Ozark with United Air Lines' service between Des Moines and Chicago, Bryan thinks it is unnecessary to place a restriction on the new authority to protect United. Advantages of speed, reliability, additional airline equipment and quality of service to flight offered by the trans-continental local airlines on routes where the two compete, according to the report.

The examiner feels that reorganization of Braniff at Ottumwa won't adversely affect revenue to any extent and that expansion of Burlington would enable Braniff to eliminate DC-3 service between Oklahoma and Kansas City. Elimination of the DC-3 flights would allow Braniff to make substantial savings.

Bryan feels that evidence on record is to DC-3 operations that the rate that the route should be deferred for inclusion in the Seven States case where a more extensive record can be developed.

North American Signs Government Contract

North American Aviation has signed a \$2,400,000 contract with the United States Government to transport military personnel between New York City and Frankfurt, Germany. Under terms of the contract, which went into effect Feb. 1, some 150 round trips will be flown between the two points by North American DC-4's. Removal date for the contract is July 1, 1959.

Balloons Test Upper Air

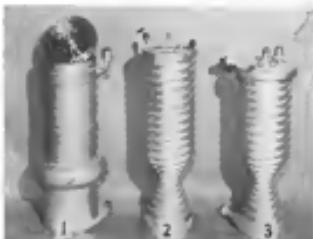


BALLOON INFLATION through the long sleeve in the first step of the launching sequence for three improved Multi-Disk research vehicles. Propane gas is released from a collection of methanolized dots above 30,000 ft. as a possible aid in locating meteorologically active weather. Other data to be gathered include calibration on jet streams, photography of cloud systems associated with green flashes, and radio propagation.



LAWNCIRKING of the hydrogen-filled balloons will be done at stations in Europe, Alaska and Hawaii this year, to observe program goals. Weather balloons will make data in attempts to measure forecasting. Balloons are discarded if they fail to reach 10,000 ft. or after they descend to that level, to reduce hazards to aviation operations. More than 4,000 balloon flights have been made.

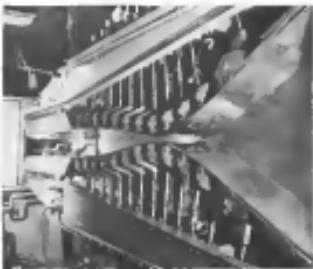
MISSILE ENGINEERING



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Cal Tech's Role in Missiles, Rocketry

My Town Story

Pandemic, Cold-Fundamentals research in guided missile and rocket science, incorporating the areas of aerodynamics, acoustics, thermodynamics, plasma, metallurgy and fluid mechanics, is one of the vital roles of California Institute of Technology's Jet Propulsion Laboratory.

In addition, JPL undertakes a limited amount of end item development, such as complete weapons systems and isolated components. For example, it is now working on the Sergeant ground-to-ground missile. The laboratory's past developments include the Capord ground missile, now in ballistic service in Germany; the WMC Capord, fast high-altitude sounding rocket; develop-

oped in the U. S., and the first successful JATO use in the country.

Results of the laboratory's work are widely distributed among authorized defense agencies and institutions—during 1955, JPL published 128 reports, of which 51,300 copies were distributed.

Man workload is tested by the Laboratory's five major divisions—Aero-
acoustics, Guided Missile Aerodynamics,
Guided Missile Engineering, Rockets
and Materials and Applied Research.

Aerodynamics

The Aerodynamics Division can conduct experimental high speed wind tunnel tests for guided missile projects and supersonic aircraft projects for Air Forces and Army Ordnance contractors.

The division head is Frank E. Goldfarb.

- Polaris missile (USAF)
- Nascent missile (USAF)
- Convair B-58 (USAF)
- Marquardt engine for the Bonanza aircraft (USAF)
- Sergeant missile (Army Ordnance).
- Honest John missile (Army Ordnance).
- NACA research (NASA Goddard).

* **Nine aircraft** (Arne Oldsberg)
Corporal mumble (Arne Oldsberg)

The Laboratory's facilities include two supersonic tunnels. One, with 12x12 in. test section, operates up to a speed of Mach 4. The other has a 18x28 in. test section, operates up to a speed of Mach 5. A fluid tunnel, with a speed range of Mach 5 to 8, is also available.



LAUNCHED AND LAUNCHER. Army's Corporal surface-to-surface missile takes off at White Sands Proving Ground (above) on test firing. Firing table and shot director are incorporated in PDU-developed launcher (right) shown ready for field use. Which makes the shot public.



Corporal Missile Developed at JPL

The Corporal, short-range ballistic missile, now in service with Army field forces in Germany and training units in the United States, originated at a research vehicle developed by the Jet Propulsion Laboratory of Cal Tech.

Originally designated Corporal E, the test design was adapted for weapons use as a back-up for another Army missile program. Corporal is now in production, with 100 units built under a contract with Reaction, The and Rubber Company prime contractors in California, and Mattocks as a subcontractor. Ryan Aerostatic builds the rocket motor case and motor assembly.

Corporal is one of a series that started with the Fuzible in the early gunpowder days, and may well be the solid propellant Negro.

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scheduled for operation by the end of 1957. Its test section will be 21 m square.

One function of the division is to conduct a program of photogrammetric basic aerodynamic research studies. These have been used to provide an accurate assessment of the general problem of transition from laminar to turbulent flow at supersonic speeds—a critical condition affecting missile performance and heat transfer.

Another wind-tunnel study is concerned with the effects of surface roughness on skin friction drag and boundary layer transition.

Considerable advances have been made by the division in the development of specialized instrumentation and techniques for noninvasive measurements at high speeds.

Guided Missile Aviation

The job of the Aviation division is the development of guidance systems for specific missiles developed at JPL. Another is to perform special guidance tasks in an advisory capacity, for Army Ordnance.

The division also performs research in the fields of acoustic and electronic control having potential application to guided missile developments either at the laboratory or at other agencies. Typical of the projects under way are theoretical studies in mathematics and analysis of communications and radar systems.

Another unique project is the application of transition, other sensors, steering devices and magnetic amplifiers to missile guidance.

One program which may bring considerable improvement and simplification to guidance and communications systems is the study of an ultra stable frequency source.

A frequency stability of one part in a billion (10^{-9}) is believed possible through use of the oscillation of the atomic nucleus. In the developmental area the division has progressed in the field of atomic indicators. The FMFM television system, now accepted as standard and utilized by most missile developers, was developed at the laboratory in 1945.

The division also has pioneered in the study of missile flight environments and their effect on aircraft components. As a result of these studies, new construction techniques for aircraft components have been evolved which enable them to function under rigorous conditions encountered in flight.

The division is headed by J. J. Burke.

Guided Missile Engineering

The Guided Missile Engineering division develops developments in materials, propulsion systems and actuators into practical, engineered de-

vices for application to rocket and missile vehicles or components. An example is the development of the fuel-cell rocket motor, made from a relatively heavy experimental rocket motor originally developed in the laboratory.

The division includes four main activities:

Liquid propellant development. This activity is responsible for the prototype development of experimental propellant components and their integration into complete propulsion systems. This activity does full scale testing of complete propulsion systems of Edwards AFB.

Mechanical ground equipment engineering. This group develops supporting equipment for guided missile systems development, for transportation, loading and launching.

Engineering design and development. This activity is primarily concerned with complete structural design of missiles developed by the laboratory. The activity also has the responsibility for conducting ballistic studies of missiles based on information of aerodynamics and earlier performance characteristics.

Military and industrial services. This group provides contractor and military liaison for the measurement of technical data of missiles, sonic nozzle expansion, transition, transonic and supersonic regions relating to guided missile systems.

Some of the achievements of the division include the WAC Caged Sounding rocket, participation in the Berlin WAC, which reached a record altitude of 244 mi in 1947; Caged missile and associated ground equipment, and developments in migrants with cooled, lightweight accelerometers.

Divisions head is Dr. E. F. Fischbeck.

Rockets and Materials

The Rockets and Materials division is responsible for the development work in solid and liquid propellants and in materials research.

One propellant developed at the laboratory is composite solid rocket fuel of fourth grade oxidizer dispersed in a plastic fuel of the type used in a large number of JATO units and solid projectile rockets.

Development work on this type of propellant is continuing.

Propellants are first tested in laboratory-type rocket motors. Later applications to full-scale rocket motors and guided missiles is investigated.

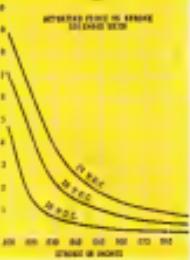
In the development of liquid propellants additional emphasis is placed on the design of the serial model missile's combustion chamber and its injector.

The laboratory shell tests experimental units with up to about 2,000 lb thrust. Larger experimental rocket motors developed and built at the

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Stodgy Supply Ministry Blocks Progress

By Sir Roy Fedden

I would suggest that the end of the last War was a critical time in our aviation history, and although we were surfing like a wildcat, more than at the end of the First World War, nevertheless, is a number of clever improvements we finished up with a series of successful aircraft from which the best day had been spurned out while America had built a tremendous parallel programme of development, especially on the fighter front. However, such an output approaches four times ours now.

From then onwards, I consider we started to lose our grip. Noddy in those years would baffle the tremendous effect of the British nation in these two World Wars except in the air, and no one will ever forget the enormous debt of British manpower which enabled the overthrowing of the world in a bold and broad ideology, but we must also admit that for the greatest part the genius that lay behind the great general war effort, industrial and scientific research, technical training and hard work in the glow of the successful accomplishment of their War effort.

We acted on our war-time birth, and we did not fully appreciate the implications of the new aircraft technology our enemies had accumulated in a most able way, and what a profound change was about us in everything to do with the design and development of aircraft.

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Those who went to Germany, and had the guts to do so, were staggered at the advances made in seconds, the scale of their equipment and the number of trained engineers required to operate these activities. These stats give some faint glimmers of what is going to happen in the near future.

Potential Enemy

By that time that country, drained to the last drop financially, was fed by well-educated and, in fact, necessary war-harding citizens and administrators, who were in full force in the foundations of the Welfare State, all of which was dedicated to ensure the peace of the new Labour Government of a better world to live in.

In the flesh of course there was a lack of resolution she is, rather, just around the corner than via an other potential enemy who had learnt all the tricks of Germany, and for whom the most highly developed Nazi techniques was just "another's walk".

It is not in an era of great buoyancy and a general sense of well-being throughout, that there were these many other mundane things to be done of home; it was growth, fact that we could not wholeheartedly subscribe to the tremendous specialisation of material and capital re-investment that was demanded to produce them new, than sweep wing aircraft of the future. They would undoubtedly come, but all in good time.

To be fair, I do not suggest that this was the attitude adopted. In all, but it is true when one accepts an idealistic view, we had the best political party amongst the non-communist politicians, namely Churchill. Take the question of the overseas posts as tributary reported alone. It seems unbelievable today that丘吉爾 stopped that by writing me, Sir Sefton Cropp from building up a nucleus of designers and draftsmen for the aircraft industry in 1945, veterans saying that they could not improve them, and the press that they brought us back not to set up the College of Aeronautics, saying that it would not be wanted.

Unfinished Standpoint

The short-sighted and uncooperated standpoints was present for some time after the War as evidenced in a number of abortive trial types. Eventually we woke up to the fast piston technology, and although partly short of aircraft equipment, since excellent de-

signs and engineering has been assembled. The overall picture is nothing like good enough, however, and today we cannot take our proper place in the sun with the few aircraft. In fact, Analyst cannot take us very seriously at all in regard to an actual serial fighting force. Although she still has a great need for war-reducing stability and increasing capacity along certain lines of aeronautics, but is attacked and because of how we have lost ground. As for civil transport, at present we have only got one "foot in the door" with the Concorde.

At the present time our failure in these vital matters has opened up in certain quarters as much as 50% of money and delays on production. It is obviously a lack of a great many things, but not money.

Missile Information

It is easy to be wise after the event, and it required exceptional courage and foresight to appreciate how fast things were going, and that the majority of the new developments in aircraft and missile technology progress on a most difficult and erratic a double track as was anticipated. I will consider that aside as the older information on intercontinental guided missiles which was brought back from Germany was looked upon as Jules Verne dreams, but many of them have already been realised, although probably far from some other countries, although we may well still be some way off from path broken worldwide.

About 25% of the people employed in an aspect of aeronautical endeavour in Britain have, over the past 10 years, worked hard and learned their trade, now wholeheartedly and resolutely to another than our Sefton, but I venture to say that the remainder will let the rate down. Many of them, thoughtful, through lack of leadership, others have runted ranks short, both physically and mentally, while the others have given the rest of the Home Fleet and home pretty satisfied and idle.

Further, an account of that deteriorating quality of the British of flying down and outshining new things became the norm, and maintaining a false attitude of complacency, or even a sense of fresh techniques, which is the pith of life engineering, we have arrived at the difficult position in which we find ourselves today.

It was hardly possible for the aeronautics industry to escape the general set-up

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go back to the Air Ministry. At present, the whole Ministry of Supply set-up is too cumbersome and impersonal ever to keep track of such a quickly moving technique as assault.

Civil Engineering

An urgent and instant encouragement must be given to construction to put up premises learned thinking civil aircraft designs and constructively develop for prototypes and necessary developments which would be of great value to the Ministry of Transport & Civil Aviation for the supply of these new types. These contracts should be managed by the Air Registration Board as

the administration and inspection arm. The non-governmental agencies we have should be free to negotiate their requirements with industry without any intermediary. Similar conditions should apply to other companies and individuals working to purchase aircraft.

The record of the last 10 years does not indicate that the Ministry of Supply has been successful in solving, buying, and generally placing a leading part in the purchase of aircraft for the two chosen requirements.

Wrong Conceptions

Without wishing to be derivative, it is usually on this account that large

sums of money have been wasted on unsuitable civil projects, often wrongly conceived, and by continuing with them long after they have ceased to have my chance of being commercially successful. It is believed that this has been at the root of some of our civil aircraft troubles as much in lack of experience and inadequate engineering strength.

I deplore the general lack of the Aeromotor factor in aircraft production, as a powerful factor in aircraft production, as I do. I believe, to persist for a further reduction in staff, the losslessly have concluded on a greater大陸ization on inspection dates. Our high standards in the past, and what exist today, have been built up on the system evolved in the same who devised, developed, and ultimately controlled this organization.

Whereas I am sure there are some excellent people in the Aircraft Inspection Directorate today, the practice of further delegations can well be discontinued and it will in turn with the reorganization of the much larger aircraft techniques now being developed.

Driving Force Missing

Where is the driving force and personality of Bagall Wild or Dethin? The new family of aircraft and power plant require both ideas and new techniques for inspection, rather than sticking to the old book of words and lowering the grip, as a time when there is a general let up throughout the whole moral fibre of the nation. Individual responsibility has increased ten-fold during the war. The need for technical importance is greater than at any time in the last 10 years.

Government departments can be, and have been in the past, of no much help to industry by showing enterprise, leadership and engineering wisdom on a whole host of matters, and in setting up new standards when industry was developing new techniques. In my view the present Ministry of Supply set-up does not permit with an organization to indicate and encourage a courageous and imaginative drive to take the lead and move the rest in new developments.

We had such leaders 25 years ago and their played an important part in helping to build up the aircraft industry, but now they either do not exist, or else are not given the freedom to function. Nowhere has there been so much opportunity, however, for this kind of leadership.

High Level Authority

There should be well-established high level engineering techniques which are able to take care of high speed operations and new delivery job software, failure to meet specifications and program parameters. It does not seem the government bill to have men who can only

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shock the expenditure of money, but have not yet had the authority or practical work experience to determine whether there is a justification for such expenditures.

Without any case expenditures of government money, notable heads of the technical community could have been so much more help to industry by suggesting new ways and means, so that they could write "new bibles" to work from, instead of sticking to those of 25 years ago.

The lack of imagination on the part of the government departments has dampened down and largely lost the urge for our post-war research.

More inspiration, leadership and good engineering can and must be forthcoming from the government technical branches for our Military Service. Progressiveness that has been shown in the last decade.

If the dignity, importance and responsibility are high enough, the best brains in the country will strive to enter this important branch of government service.

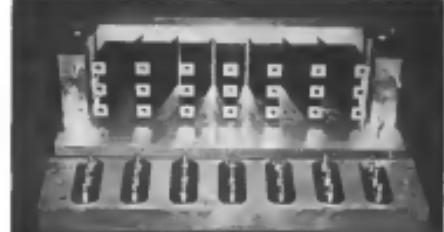
It need not necessarily be a long dole, but it must be a career effort, and this can only come about if it has full authority, and has complete support from the technical branch.

(This is the second in a series of four articles on aircraft vibration. Work at a preceding issue made it fit Jim Fodder before Boston's Annual Conference on Problems of Aircraft Production. See Review issue this October in preview of the Research and Development Division of the aircraft industry and its future aircraft design to the North American Test Organization.)

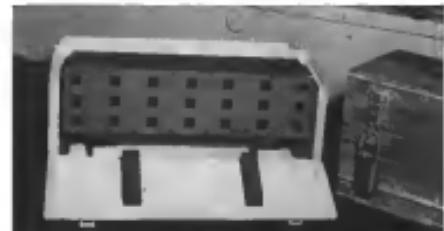


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- Part mold in vacuum chamber to rack

air bubbles out of gel cast.

- Allow the mold time to cure.

- Crimpkitch off the mold, first with glass nibbles, then posing more resin around the nibbles. The nibbles reduce the possibility of thermal stresses cracking the thin cast by reducing the resin mass and absorbing some of the heat produced in the forming process.

- Let the lamination resin cure. Epoxy resin can be cured at room temperature without added pressure. This prevents ordinary mechanical clamps to use space without additional equipment.

- Remove the mold. In designing a part for this process, draft must be allowed on all surfaces or special techniques must be used to pull the mold away from the part.
- Vapor cast with aluminum to give optical surfaces reflectivity.

- Northern has used the process, developed by tool engineer Paul Wixson, to produce a number of optical testing devices for the Navy.



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AVIONICS

Communications Chores Limit Capacity to Control Traffic

By Philip J. Klass

New York—Executive voice communication chores imposed on air traffic controllers, and not intention of the air space, is the real cause of delays and traffic capacity limitations.

These conclusions, drawn from detailed studies in the Boston area, were reported here in the recent Institute of the Aeronautical Sciences Annual Meeting in a joint presentation by Kenneth G. Van Wiesen of Bell Telephone Laboratories, and Charles F. Stanton, former Civil Aeronautics Administrator, in a consultant to Bell in its traffic control studies sponsored by the Air Navigation Development Board.

To get any appreciable improvement in traffic handling capacity, it will be necessary to make greater use of automation aids, the speakers agreed. This was also urged by ANDTAC, the association of air traffic controllers. The new study has suggested a situation in which the controller spends more than 50% of his time communicating, appears almost certain to result in large traffic delays, he said.

Getting Started

The conclusions are based on an extensive study that was made of three air traffic control sectors in the Boston and Hartford, Conn., areas, Mass., and Boston.

The area studied in the northern end of the high-density region which extends from Newark, N.J., along the east coast to Boston. It includes two major airports and many minor ones. Gains 2 and 8, which cover eastern and northwestern New England, are included.

"The number of operations to be performed by traffic controllers and the length of time in which they must be accomplished are beyond the limits of reasonable human endeavor," they recommended to the IAS.

BELL's studies indicate that smooth traffic flow would occur when the ground controller would devote more than 35-40% of his time to communications, rather than to such tasks as en route tracking, heavy and visual inspections, Van Wiesen and Stanton said. When communication chores exceed this figure, even additional percentage point gains in traffic delay of approximately 45 minutes (total) for all aircraft in the sector.

These delays may be imposed on aircraft in the air or those on the ground waiting for clearance to take off. When the controller becomes overburdened with communications, reducing the time available for making decisions and

in, giving orders of 400 to 800 feet, and inability of 1 in seven only. These will light rain or fog most of the time, frequently accompanied by 20 mph northeast winds, with scattered thunderstorms along our roads and way at 12,000 ft.

ETL Findings

ETL tested the time that controllers in each sector spent in communications with other units or controllers with the Boston control tower, with airline radio operation and dispatchers, and in direct radio contact with aircraft—and figured out a lot percentage this represented of the total time.

The figures reveal the following average controller communicating time per sector:

- **Hartford:** 69.9%

- **Salem:** 54.4%

- **Boston:** 45.7%

- **Region 8:** 31.2%

The Boston sector had a second controller who handled radio communications to aircraft exclusively. Without the second man, the controller radio and telephone communications load would have been "unbreakable" 80%, the authors pointed out.

Avg. Computing the total aircraft miles flown during each sector for 100 minute increments, ETL arrived at an earlier estimated figure of 4.5 minutes delay for each additional percent above 35% devoted to communications.

Communication Capacity

Bell's studies indicate that the controller need spend no more than 10% of his time in communications, totaling one minute per each flight segment that passes through this sector.

Thus the study reported, includes all communications both with the sector and other ground personnel required to move the traffic through the air space.

Instrument Weather

The communicating time per unit per aircraft handled for individual sectors in the Boston area are as follows:

- **Hartford (international):** 1.5 min

- **Boston (international):** 1.9 min

- **Boston (domestic):** 2.0 min

- **Boston (Hartford & environs):** 2.3 min

Applying ETL's figure of 50% of the maximum time in which a controller should have to spend in communications chores, the above figures reveal that the number of aircraft per hour which can be handled in the Boston area sectors without appreciable delay ranges from 16 to 28, depending upon the sector.

While the number of aircraft operating in one sector averaged 19 per



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44-4	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-5	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-6	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-7	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-8	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-9	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-10	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-11	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-12	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-13	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-14	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-15	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-16	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-17	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-18	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-19	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-20	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-21	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-22	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-23	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-24	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-25	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-26	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-27	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-28	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-29	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-30	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-31	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-32	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-33	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-34	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-35	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-36	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-37	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-38	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-39	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-40	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-41	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-42	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-43	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-44	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-45	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-46	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-47	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-48	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-49	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-50	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-51	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-52	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-53	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-54	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-55	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-56	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-57	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-58	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-59	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-60	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-61	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-62	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-63	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-64	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-65	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-66	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-67	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-68	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-69	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-70	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-71	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-72	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-73	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-74	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-75	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-76	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-77	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-78	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-79	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-80	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-81	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-82	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-83	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-84	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-85	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-86	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-87	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-88	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-89	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-90	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-91	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-92	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-93	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-94	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-95	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-96	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-97	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-98	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-99	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-100	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-101	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-102	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-103	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-104	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-105	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-106	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-107	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-108	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-109	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-110	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-111	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-112	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-113	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-114	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-115	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-116	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-117	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-118	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-119	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-120	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-121	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-122	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-123	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-124	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-125	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-126	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-127	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-128	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-129	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-130	44 Ah	10 amp	6.5	1.15	1.25	2.5	2.0 Ah
44-131	44 Ah	10 amp	6.5	1.15	1.25	2.5	

New

REVERE FUEL METER

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No more separate sampling of military aviation fuels to determine specific gravity . . . no more computations to convert gallons into pounds. This new Revere Gravimetric Meter measures fuel delivered from tank truck or fueling pit to plane directly in pounds . . . in one easy step.

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hour, the peak load reached as high as 32 aircraft per hour, clearly beyond the capacity of the hostile controllers.

No Lock of Airspace

In this same time, another 10 aircraft (12) in the area had been on patrol distributed over the 1,000 miles of airways and separated into available strata between 4,000 and 9,000 feet; these would have been an average lateral separation of 150 miles between unescorted aircraft, Van Wykens and Stanton pointed out.

Admitting that this was a somewhat oversimplified view of the situation, which ignores the effect of interception and terrain, even the authors nevertheless concluded that "it does indicate the concept of a very efficient use of airspace available in the present areas for exploitation by some degree of saturation."

Automation Needed

The long range solution to this problem, Van Wykens and Stanton believe, is the use of automatic and semi-automatic data processing techniques. These could provide a complete and potential display of all information needed for controlling air traffic. Such a system would be designed to:

- Receive controller of the task of collecting, organizing and passing such information as aircraft position, altitude and extended time over a fix, which can take so much of his time in periods of heavy traffic.

- Provide controller with a comprehensive picture of the complete traffic situation, including the reading of densities and resulting traffic streams.

Such a system would do for the air traffic control what the new SAGE system does for the air defense ground controllers (AWW Jan 30, p. 46).

Automatic Intersections

For example, an attorney apart by RITA suggests the possibility of a system which would automatically calculate the areas in the area, getting back information on the density of flying, bearing and distance and altitude, without requiring any action by the pilot or controller. Such information would be stored in a magnetic drum, being sensed periodically as new data is received.

Data on aircraft position and altitude could then be displayed on a Cathode-ray tube or cathode ray tube which would present the information in a color-coded permanent-storage image, not unlike that employed in SAGE.

Such a system could be constructed today, using existing equipment and/or known techniques, the Bell Laboratory report says.

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Sperry Rand Makes Refinements In Integrated Instrument System

Sperry Rand's Integrated Instrument System has a "new look" for 1956. Refinements in design, control and overall protection from the numerous design improvements last year (AW Jan. 10, 1955, p. 61), are the result of six months of discussions with 600 airline operations personnel and pilots.

The most significant change in the three instruments involved—the Sperry compass indicator, horizon flight director and power deviation selector—include the following:

Gyroscope Compass Indicator

- Improved ADF/VOR switch, shown in Fig. 1 at left, shows precisely which function is being displayed on which pointer.

- Improved heading selector (2) makes it easier to select the desired course.

Horizon Flight Indicator

The instrument, which combines a horizon indicator with a Sperry Zenith Reader in a single indicator, has been modified as follows:

- Vertical scale (3) has been added on face of indicator, together with a black-and-white "roll mag" (4) to accentuate the degree of attitude roll.
- Flight director cross pointer (5) can be automatically retracted from view, if desired, to display only a horizon gyro indication.
- New foot locking release (6) has been substituted for the original coded ring in order to concentrate the pitch attitude of the airplane relative to the horizon.

Power Deviation Indicator

The instrument, which displays attitude position relative to ILS glide slope and minimum break-off as well as relative to VOR, has been modified as follows:

- New power flag selector (7) shows whether instrument is operating from heading or VOR on a self.
- When flying the ILS localizer, a half-yellow, half-blue flag appears, separating the blue-left/yellow-right portion of the indicator beam.

The yellow-blue flag is in effect reversed when the aircraft is flying azimuth on the back course of the localizer. When flying enroute, the flag reads "VOR" on a self.

- Glide slope flag (8) indicates "off" when glide slope pointer is not operating or signal strength is not sufficient for automatic operation.

At such times the glide slope pointer (8) is retracted from the face of the instrument.

Sperry says that long-range sensitivity of the flag indicator has been increased to permit the pilot to bracket and get onto the beam at a greater distance from the station. Contrast and general readability of the instrument markings also has been improved, Sperry says.



SPERRY'S integrated instrument system includes compass indicator (top), horizon flight director (middle) and horizon flight indicator (bottom).

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Todays' Piasecki two-rotor helicopter necessary more than twice as much power per load and costs at over 100 mg b.

The early monotor helicopter was designed in 1920. Liftoff maximum weight was 100 pounds, stability was just a dream.

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Progress in helicopter design takes a lot more in bearing performance—and Shafter Aircraft Bearings are providing it for many of today's advanced designs of rotary-wing aircraft.

The three main reasons why Shafter is specified in helicopter design are:

- 1) **Anisotropic self-alignment—easier under oscillatory loads.** This Shafter advantage offers a welcomed answer to the most severe problem faced by the designer of this class of aircraft.
- 2) **Fall capacity—under reversed loads.** Two rows of rollers enable Shafter Bearings to carry any combination of radial-thrust loads in full contact area under all conditions of misalignment.
- 3) **Relubrication—without dismantling.** Lubricating

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FILTER CENTER

• **Military Group Forward—Preliminary Group on Military Electronics (PGMEL)** is the latest addition to IEEE's growing list of professional groups, now totaling 24. National chairman of the newly formed PGMEL is Capt. G. L. Eagleman, USAF (Ret.). A Washington chapter of PGMEL has been formed and there are local chapters in the process of forming. Interested persons may write Eagleman at 3450 block St., N.W., Washington 9, D.C.

• **PGMEL Sponsor Tech Seminars**—The new PGMEL will sponsor two sessions at the national IEEE convention in New York (Mar. 19-21), and co-sponsor a third. These sessions are:

- Symposium on Air Force Communications and Electronics Problems and Philosophies
- Nuclear Effects on Electronics Systems, a report from the Nevada Atomic Testing Grounds
- Symposium on the U.S. Earth Satellite (Vanguard) Program

• **Synchronous Detection**—General Electric is developing a new radio communication receiver called "Synchro detection" which it claims is superior in the highly tested single-sideband (SSB) technique. Although USAF has given Collier Radio a major contract to develop both ground and airborne single sideband equipment for

evaluation, it also reportedly is financing GE's development.

• **Hughes "Little SAGE"**—Under Army sponsorship, Hughes Aircraft is developing a "Little SAGE" system for local air traffic control and the control of anti-aircraft guns and missiles. Interference between big and little SAGE is said to be lessened by minimizing and insulating in a series of filters.

• **New ASDE Under Test**—A new point surface detection equipment (ASDE), a high frequency (K-band) radar where detection sensitivity is so sharp that excited transistors can

make out the wings and tail of aircraft on the ground, is now undergoing tests at MacArthur Field, N.Y. The ASDE was developed by Aerobee Instruments Lab under sponsorship of the Air Navigation Development Board and the House Air Development Center. The set is slated to go to RADCOM for test, then to be retained for evaluation at N.T. Lawrence Airport.

• **Inertial Guidance Lat Growth**—List of firms engaged in developing inertial guidance systems (AWW Jan. 23, p. 78) should include Norden Kiteco's Norden Laboratories; the firm has informed Aviation Week. Any other additions?

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Automatic Checker

Rohrbach's new automatic checker measures diameter and constantly checks, up to 125 rpm per minute. Device is programmed from punched tape and can be set up to check each rotation in a tolerance of 5, 10 or 15%. Indicating whether an individual rotation is greater or less than the desired value, Rohrbach can check 240 different points per rotation. Manufacturer: Rohrbach Laboratories, Inc., Niagara Falls, N.Y.



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Components & Devices

- **Two-way magnetic clutch.** Model 1418 makes it possible to engage or disengage either one or both output shafts from a single input shaft by means of two magnetic coils. Device can be used to provide two outputs



and one output, with selection of either or both output stations to be transmitted in single output shaft. Mounting is identical to Model 8, Mod. G servo motor. Simultaneous Instrument Corp., Instrument Div., 14-17 Lummis St., Flushing 74, N.Y.

- **X-Knee theaters.** rated at 6.4 amp, for use with any type of load without the addition of auxiliary circuitry, comes with lag, linear, or switch, or flexible leads with lug. Maximum peak voltage



cannot exceed 17 amp, maximum peak current voltage 1,200 v, maximum peak reverse voltage 4,250 v. Ambient temperature range is -19°C to 70°C. Electronix, Inc., 122 Stevens Ave., Newark 4, N.J.

- **Subminiature resonant and relay transmitter.** Both an audio frequency filter and relay, Model AR-2 has two travel coils. Model AR-3 has three fixed frequencies can be tuned within range of 100 to 500 cps. Minimum driving voltage is 24 v. Device weight 14 oz. CG Electronics Corp., 301 Dallas St. N.E., Albuquerque, N.M.

- **Multigang pressure transducer** contains both an absolute and a differ-

ence and weighing 1 lb., comes with resistance of 25 to 45,000 ohms, with minimum resolution of 0.08% and optimum linearity of 1%, while span fed. Device can be operated at 150°C and reportedly meets MIL-E-5272A. Cresswell Co., Precision Instruments Div., Newton Upper Falls 64, Mass.

- **Aluminum ac to dc converter.** Type 3114 converts 200 to 400 cycle, three phase power to 26 v dc, regulated within 25.5 to 25.5 v range for input voltage variation of 190 to 210. Frequency variation of 100 to 420 cps, and loads of 3 to 20 amp. Continuous-duty rating is 15 amp, at 20 amp at



25% duty cycle for low currents. Ripple factor is 0.05. Device which weighs 1.5 lb. can be operated at temperatures of -65°F to 140°F and withstands up to 50,000 g. Bulletin GEC 1567 gives full details. Consolidated Elec-

tronics Corp., 310 N. Sierra Madre Villa, Pasadena, Calif.

- **Small, high-power mechatro transmitter.** Type 3113/39, in 35 v, 400 cycle rate, a housed in a size 10 frame and can be used to operate up to twelve 15-watt vacuum control transmitters. Input voltage is 115 v, phase shift ratio to center is 3.8 deg, and angular accuracy is 35 minutes. Null voltage is 50 mV and after removal of inertia is 24 mV. Operating temperature range is -55°C to 95°C. John Dyer Mfg. Co., Aviation Div., Racine, Wis.

Instrumentation

- **Solenoid-operated dry-shield capacitor.** can be used as a precision, transient capacitor for heterodyne equipment, oscillators, capacitance fuel gauge and servos, and for reducing piezoelectric



pickup outputs in a shielded valve for better low frequency response. Device, which measures only 1.61 in. provides capacitance values of 10 picofarads to 9,990 picofarads in discrete steps of 10 picofarad. Endevco Corp., 161 E. Clinton Street, St. Paul, Minn.

New Avionic Bulletins

- **Reader interests.** ninth annual catalog describes more than 1,000 items available in two models for mounting in X and Y axes. Catalog also includes 10 new drawings in new technical brochure section from Microlog Engineering Inc., 3100 University Dr., Seattle, Wash.

- **3113/39 solenoids.** Both linear and rotary types as well as five intermediate sizes are now available from Endevco. Alternative catalog is available from 161 E. Clinton Street, St. Paul, Minn.

- **Rotary solenoids.** Both linear and rotary types as well as five intermediate sizes are now available from Endevco. Alternative catalog is available from 161 E. Clinton Street, St. Paul, Minn.

- **Variable capacitors.** New-line compact units with variable air spacing metal and plastic housing. Weight is 1.61 lb. Water Aircraft Corp., 1100 Ontario St., Chicago, Ill.

- **Variable capacitors.** New-line variable for aircraft use includes ceramic, mica, mica and polyester, and other non-metallic dielectrics. Bulletin 1000 is available. Polder is available from Clinton Corporation Co., 1900 Clinton, Des Moines, Iowa.
- **Whistlers and radiotelephone receivers.** Models Whistler 2000, 2, 10, 12, 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000, 1010, 1020, 1030, 1040, 1050, 1060, 1070, 1080, 1090, 1100, 1110, 1120, 1130, 1140, 1150, 1160, 1170, 1180, 1190, 1200, 1210, 1220, 1230, 1240, 1250, 1260, 1270, 1280, 1290, 1300, 1310, 1320, 1330, 1340, 1350, 1360, 1370, 1380, 1390, 1400, 1410, 1420, 1430, 1440, 1450, 1460, 1470, 1480, 1490, 1500, 1510, 1520, 1530, 1540, 1550, 1560, 1570, 1580, 1590, 1600, 1610, 1620, 1630, 1640, 1650, 1660, 1670, 1680, 1690, 1700, 1710, 1720, 1730, 1740, 1750, 1760, 1770, 1780, 1790, 1800, 1810, 1820, 1830, 1840, 1850, 1860, 1870, 1880, 1890, 1900, 1910, 1920, 1930, 1940, 1950, 1960, 1970, 1980, 1990, 2000, 2010, 2020, 2030, 2040, 2050, 2060, 2070, 2080, 2090, 2100, 2110, 2120, 2130, 2140, 2150, 2160, 2170, 2180, 2190, 2200, 2210, 2220, 2230, 2240, 2250, 2260, 2270, 2280, 2290, 2300, 2310, 2320, 2330, 2340, 2350, 2360, 2370, 2380, 2390, 2400, 2410, 2420, 2430, 2440, 2450, 2460, 2470, 2480, 2490, 2500, 2510, 2520, 2530, 2540, 2550, 2560, 2570, 2580, 2590, 2600, 2610, 2620, 2630, 2640, 2650, 2660, 2670, 2680, 2690, 2700, 2710, 2720, 2730, 2740, 2750, 2760, 2770, 2780, 2790, 2800, 2810, 2820, 2830, 2840, 2850, 2860, 2870, 2880, 2890, 2900, 2910, 2920, 2930, 2940, 2950, 2960, 2970, 2980, 2990, 3000, 3010, 3020, 3030, 3040, 3050, 3060, 3070, 3080, 3090, 3100, 3110, 3120, 3130, 3140, 3150, 3160, 3170, 3180, 3190, 3200, 3210, 3220, 3230, 3240, 3250, 3260, 3270, 3280, 3290, 3300, 3310, 3320, 3330, 3340, 3350, 3360, 3370, 3380, 3390, 3400, 3410, 3420, 3430, 3440, 3450, 3460, 3470, 3480, 3490, 3500, 3510, 3520, 3530, 3540, 3550, 3560, 3570, 3580, 3590, 3600, 3610, 3620, 3630, 3640, 3650, 3660, 3670, 3680, 3690, 3700, 3710, 3720, 3730, 3740, 3750, 3760, 3770, 3780, 3790, 3800, 3810, 3820, 3830, 3840, 3850, 3860, 3870, 3880, 3890, 3900, 3910, 3920, 3930, 3940, 3950, 3960, 3970, 3980, 3990, 4000, 4010, 4020, 4030, 4040, 4050, 4060, 4070, 4080, 4090, 4100, 4110, 4120, 4130, 4140, 4150, 4160, 4170, 4180, 4190, 4200, 4210, 4220, 4230, 4240, 4250, 4260, 4270, 4280, 4290, 4300, 4310, 4320, 4330, 4340, 4350, 4360, 4370, 4380, 4390, 4400, 4410, 4420, 4430, 4440, 4450, 4460, 4470, 4480, 4490, 4500, 4510, 4520, 4530, 4540, 4550, 4560, 4570, 4580, 4590, 4600, 4610, 4620, 4630, 4640, 4650, 4660, 4670, 4680, 4690, 4700, 4710, 4720, 4730, 4740, 4750, 4760, 4770, 4780, 4790, 4800, 4810, 4820, 4830, 4840, 4850, 4860, 4870, 4880, 4890, 4900, 4910, 4920, 4930, 4940, 4950, 4960, 4970, 4980, 4990, 5000, 5010, 5020, 5030, 5040, 5050, 5060, 5070, 5080, 5090, 5100, 5110, 5120, 5130, 5140, 5150, 5160, 5170, 5180, 5190, 5200, 5210, 5220, 5230, 5240, 5250, 5260, 5270, 5280, 5290, 5300, 5310, 5320, 5330, 5340, 5350, 5360, 5370, 5380, 5390, 5400, 5410, 5420, 5430, 5440, 5450, 5460, 5470, 5480, 5490, 5500, 5510, 5520, 5530, 5540, 5550, 5560, 5570, 5580, 5590, 5600, 5610, 5620, 5630, 5640, 5650, 5660, 5670, 5680, 5690, 5700, 5710, 5720, 5730, 5740, 5750, 5760, 5770, 5780, 5790, 5800, 5810, 5820, 5830, 5840, 5850, 5860, 5870, 5880, 5890, 5900, 5910, 5920, 5930, 5940, 5950, 5960, 5970, 5980, 5990, 6000, 6010, 6020, 6030, 6040, 6050, 6060, 6070, 6080, 6090, 6100, 6110, 6120, 6130, 6140, 6150, 6160, 6170, 6180, 6190, 6200, 6210, 6220, 6230, 6240, 6250, 6260, 6270, 6280, 6290, 6300, 6310, 6320, 6330, 6340, 6350, 6360, 6370, 6380, 6390, 6400, 6410, 6420, 6430, 6440, 6450, 6460, 6470, 6480, 6490, 6500, 6510, 6520, 6530, 6540, 6550, 6560, 6570, 6580, 6590, 6600, 6610, 6620, 6630, 6640, 6650, 6660, 6670, 6680, 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USAF Contracts

Following is a list of unclassified contracts for \$25,000 and over as released by the Defense Contracting Office:

BUREAU OF AIR FORCE EQUIPMENT AND MATERIALS

Cessna Aircraft Co., 2500 Rockwell Rd., Wichita, Kans. 67205, \$10,000, production RPPF contract, 1000 Cessna 180 aircraft, 1967-68.

Learjet Corp., 2015 Aviation Blvd., Los Angeles, Calif. 90048, \$10,000, production of 1000 RPAF Learjet Model 23 type No. 1100, 1968-69. 1000 RPAF Learjet Model 23 type No. 1100, 1968-69.

Northrop Aircraft Products, Inc., 2000 University Rd., Mountain View, Calif., 94035, production of 1000 RPAF Northrop T-38 aircraft, 1968-69. 1000 RPAF T-38 aircraft, 1968-69.

International Business Corp., 1021 Grand Ave., El Segundo Calif., 90245, production of 1000 RPAF B-57 aircraft, 1968-69. International Business Corp., 1021 Grand Ave., El Segundo Calif., 90245, production of 1000 RPAF B-57 aircraft, 1968-69. 1000 RPAF B-57 aircraft, 1968-69.

Boeing Commercial Airplane Co., Inc., 900 Madison, Seattle, Wash. 98101, production of 1000 RPAF B-57 aircraft, 1968-69.

General Electric Co., Lamp Dept., 100 W. Williams St., Milwaukee, Wis. 53204, 1000 Instrumentation single channel frequency measurement system, 1968-69. 1000 Measurement of each base, 1000 RPAF aircraft, 1968-69. 1000 Measurement of each base, 1000 RPAF aircraft, 1968-69. 1000 Measurement of each base, 1000 RPAF aircraft, 1968-69. 1000 Measurement of each base, 1000 RPAF aircraft, 1968-69. 1000 Measurement of each base, 1000 RPAF aircraft, 1968-69. 1000 Measurement of each base, 1000 RPAF aircraft, 1968-69.

Navy Contracts

Following is a list of unclassified contracts of \$25,000 and over as released by Navy Contracting Office:

BUREAU OF AERONAUTICS, Washington D.C.

General Electric Co., 1100 Lamont St., Denver, Colo. 80203, production contract 1170-337-100-100, 1000 GE-1000, 1967-68.

Piper Aircraft Co., 1041 W. Century Blvd., Los Angeles, Calif., 90045, 1000 PA-28 aircraft, 1967-68. 1000 PA-28 aircraft, 1967-68. 1000 PA-28 aircraft, 1967-68.

McDonnell Aircraft Corp., P.O. Box 600, St. Louis, Mo. 63166, 1000 McDonnell Douglas F4D aircraft, 1967-68. 1000 McDonnell Douglas F4D aircraft, 1967-68.

Aerospace Propulsion Co., P.O. Box 600, Cincinnati, Ohio 45201, 1000 AP-1000, 1967-68.

New York Air Guard, 2000 Broadway, New York, N.Y. 10020, 1000 AN-655 propeller, 1967-68.

Naval Air Warfare Center and Instrument Corp., Kodak Lab., Research Park, East Fishkill, N.Y. 12533, production of 1000 AN-655 propeller, 1967-68.

Gilbert Co., Chemung-Potomac-Morris Div., 1000 Potomac St., Morris, Pa. 17461, 1967-68.

Marine Corps Air Service, Quantico, Va. 22192, 1000 AN-655 propeller, 1967-68.

Continental Motors Corp., 1000 Cessna 1100, 28000 Cessna Rd., Wichita, Kans. 67205, 1000 Cessna 1100, 1967-68.

Continental Motors Corp., 1000 Cessna 1100, 28000 Cessna Rd., Wichita, Kans. 67205, 1967-68.

Continental Motors Corp., 1000 Cessna 1100, 28000 Cessna Rd., Wichita, Kans. 67205, 1967-68.

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Continental Motors Corp., 1000 Cessna 1100, 28000 Cessna Rd., Wichita, Kans. 67205, 1967-68.

NEW AVIATION PRODUCTS

Bearing Overheat Detector

A low bearing overload detector thermometer for aircraft bearing lights or as a remote indicator. No amplifier, timer or bridge pickup box is used. The detector may be supplied for any temperature settings up to 550°F.

Thermal switch 5187 meets USM



2 MIL-S-25145, and 2 MIL-R-8772A, and has been approved for the qualified tribot products list.

The thermal switch is threaded into a slot top in the housing at the various settings to be provided. One terminal contact is grounded to the housing; the other is a copper lead with Teflon glass fiber insulation. Temperature setting is up to 550°F, which is expanded up to twice proper metal-to-metal contact with the housing.

Vapor Heating Corp., Dept. PR 56, 80 E. Jackson, Chicago, Ill. 60604.

Pump Motor Gives 11.5 Hp.

Extremely good circumferential airdraulic pump motor delivers 11.5 hp at 2,195 rpm, for 10 sec. Type GA pump weighs 25 lb. will deliver 1.5 hr for 170 sec. It operates on three-phase



600 cycle alternating current up to 25,000 ft altitude and has starting torque of 45 lb. ft. The pump is oil circulating and is designed to withstand specific operating conditions.

U.S. Electrical Motors, Inc., Aircraft Division, Box 230, Terminal Annex, Los Angeles 54, Calif.



Flex Coupling for Precision Use

Flexible coupling transmits rotation and torques through a range of angular deflections up to 10 degrees. The G-100 series is suitable for shaft diameters between 1 in. and 10 in. and is said to be especially suitable for precision applications.

Coupling features three diaphragms located between the two hub flanges. Two set screws on each hub prevent parts from becoming loose on the shafts and allow adjustment.

Otolin Tool & Arms Corporation of America, P.O. Box 3040, Adelphi, Md. 20783.

100,440 cps., guaranteed efficiency (50% adiabatic), 51,000 ft., altitude, 50,000 ft., weight, 3.5 lb. Jack & Jones, Inc., Cleveland 1, Ohio.

T-1 Aircraft Selector Valve

New line of miniature solenoid selector valves for aircraft oil-hydraulic systems features a seven-cylinder one piece design. The valves basically combine four-way closed center solenoid selector valves with special anti-friction seating ratings to an system offering an all-sealed type construction control. They are



specifically designed for high-pressure high-temperature installations requiring two-way actuation of control at two different rates of response.

The miniature valve measures the same for external dimensions as 100,440, but, because of its smaller size, can handle pressures up to 4,760 psi, ambient air temperatures to 150°F, various fluid temperatures to 160°F, and internal fluid temperatures to 400°F.

Visors, Inc., 1400 Oakton Blvd., Detroit 32, Mich.



High Altitude Power Transformer

Wynnelectric GC190 transformer for conversion of three-phase ac. power from 208 v. line to 115 v. line-line is first of a series of three units by Jack & Elmer. The unit is designed to MIL-T 9219.

Terminal block and terminal cover are of machined aluminum block plastic. Cover is machined with ac. current carrying capacity ratings to the housing line. Neutral point of the pressure winding is isolated from the core and is brought out to a separate terminal.

Specifications include rating, 1.5 kva at 88 power factor, frequency,

A. C. Overvoltage Relay

Overvoltage relay for aircraft ac. power provides voltage protection and reverse phase delay characteristics with three static solid-state components.

The relay consists of only one main part in the structure of the shielded static relay used to control the

terminal devices such as mercury breakers or field relays.

Unit uses silicon diodes and transistors mounted on a printed circuit. It is said to maintain accurate voltage from -50°F to +250°F. It weighs 13 oz and requires 25Wdc in operation. Input 0.5 watt.

Westinghouse Aircraft Equipment Dept., Westinghouse Electric Corp., Wappingers Falls, N.Y., 12590.

Portable Power for Field Test

Portable, 400-cycle power supply for field use in testing and servicing aircraft instruments can operate from



one 115V, 60-cycle line, and features continuous variable voltage output from 90V to 125V as required. A three position switch selects one per frequency of 400, 400 and 440 cycles with a selector control for fine ad-

justment at any setting. Stable output ± 1% vs.

Unit weighs less than 7 lb, and measures 12x12x14 in.

Aerospace Inc., 58-35 Northern Blvd., Woodside 77, N.Y.

ALSO ON THE MARKET

Type SC blower for variable frequency operation is designed for single-phase operation and needs only one phase input. Airflow varies from



42 to 50 cfm at zero back pressure. Weight is 5 lb, dimensions 21x12x12 in.—Globe Industries, Inc., 1734 Stanley Ave., Elkhorn 4, Ohio.

Airport luggage handling truck has 1,000-lb. capacity and can be pulled manually or attached to a tractor. Slanted wooden deck is 96 in long × 36 in wide. There is a dc19x22in. steer-



ing and swivel casters. Maximum weight is 1,200 lb. Dimensions are 100 in long × 48 in wide × 48 in high. Weight is 1,000 lb.—Lug-A-Way Products, Inc., Dept. R-11, Waterford, Mich.

Air Force-Navy approval has been granted milspec H-80 series Kaylock harts with a load rating of 40-4.52, 9.82, 14 in. 28, and 34 in. 24. Units are said to weigh less than half of conventional nut-screw. For more information on H-80 Landing Lamp write General Electric, Miniature Lamp Department AW-3, Nela Park, Cleveland 13, Ohio.

Resin-type thermosetting adhesive for honeycomb skin/bulkhead construction are designated EC-1777 and EC-1415. They

can be used for bonding phenolic impregnated kraft paper. Temperature to 500° Fahrenheit. Adhesive used at maximum—Marconi-Milagro and Manufacturing Co., 41 Rapier Ave., Detroit 77, Mich.

Silicon battery combines strength and low advantage of a aluminum couple with long life characteristics of nickel-cadmium couple. Using a 6-cell 12-volt, the unit has a weight of 4.5 lb and dimensions of 9.85 in. diameter × 15.5 in. and working voltage of 12.5—Yankee Electric Corp., 44 East 3rd St., New York, N.Y.

High pressure nozzle kit for service up to 1,000 psi at 200°F features an equilibrating vent preventing use of glass nozzles taken at elevated temperatures without loss of tube rupture. Kits are stocked in steel and 100 stainless steel.—Brooks Instrument Co., Lincoln, Pa.

Hydraulic model MR-712-48-2 features varying thicknesses of metal without re-setting the power stroke. Ram develops pressure as it meets resistance until it reaches its maximum thrust of 12 tons



Cycling is automatic; pressure obtained by fluid flow in a closed loop. Dimensions are 48 in. long × 10 in. diameter × 10 in. high. Weight is 1,000 lb.—Kraus Manufacturing Co., Bradley, Ill.

Steel cage net Model A-2 is made of aircraft control cable, weight 14.5 lb and measures 16x16 in. A variation of this net is the No. 40-190 using a basic diamond grid weave fabricated in the form of an enclosed cage for helicopter use. A sheet glass pilot button is installed integrally—Eastern Rotocraft Corp., Brooklyn, Pa.

Synthetic rubber O-rings for use as seals with MIL-O-8180 and MIL-C-97 fluid seals at -65°F to +400°F are designed for aircraft use. The compound has also been tested at 400°F with a blend of

THE NEW ARTOS AUTOMATIC wire-stripping and TERMINAL-ATTACHING MACHINE



Artos TA-20-S
with power-unit



This new Artos TA-20-S brings full greater speed and precision economy to large quantity users of wire leads with terminals attached. It automatically performs the following services all in one operation:

1. Measures and cuts wire to predetermined lengths.
2. Strips one or both ends of wire.
3. Automatically strips any preformed terminal or strip former to one end of wire.
4. Marks finished wire leads with code numbers and letters. (Optional attachment not standard part of machine.)

ALL OPERATIONS ARE AUTOMATIC. Machine can be operated by unskilled workers. It is easily set up and adjusted for different lengths of wire and stripping. The arms for different operations remain simple and quickly changed. Production speeds up to 3,000 finished pieces per hour.

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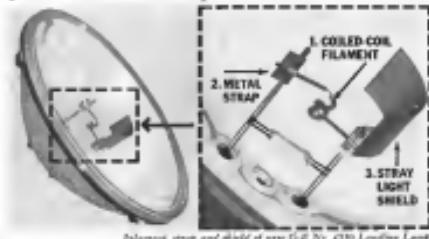


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Element, strap and shield of new G-E No. 4389 Landing Lamp

New G-E 600-watt landing lamp has 3 major improvements at no added cost

2. IMPROVED BEAM PATTERN.

Because the filament is bent and can pass through a circular, cone-shaped beam without appearing dark spots.

3. BEAM PATTERN MAINTAINED THROUGHOUT LIFE.

A new method of securing the filament to the lead-in wires provides extra tight support against the filament during its initial period and the beam pattern does not shift. For more information on G-E Landing Lamp write General Electric, Miniature Lamp Department AW-3, Nela Park, Cleveland 13, Ohio.

A new coated filament has a much more strength and rigidity that it needs no supports to keep it from sagging. This results in a substantial saving from supports when in tubular fixtures from the filament while the plane is in flight.

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15% MIL-G-5200 and 35% Monopole DGS, known as MIL-G-8115, fluid—Peter Appliance Co., Rubber Product Division, 17325 Radio Ave., Cleveland 12, Ohio.

High temperature electric furnaces have often been installed due to space protection. Six models, all working up to 2,300° Fahrenheit and 122°F con-



tinuous temperature, range from \$15,000 to \$150,000. (—Asia-Central Laboratories, 3645 Schmitz Dr., Culver City, Calif.)

Autostitch deburring machine is capable of handling 200 multiaxis broached blocks per hour, the market reports. Parts pass through five standard deburring stages and are indexed onto five positions. (Pulley Branch Co., Milwaukee Division, Hartford, Conn.)

Speedy Driller is a high-speed semi-automatic machine that bores and drills holes in response to two touch programs on an attached template. Holes may be drilled at rate of three per second, in 0.004 in. diameter. Machine weighs about 165 lb. It was developed by Aircraft Engine & Appliance Corp.'s Aircraft Division, Hagerstown, Md.—Frictional Engine & Appliance Corp., 5000 Central Division, St. Augustine, Fla.

Aluminum-silicon paint resist temperatures in excess of 1,300° and requires no primers to apply. It is useful in extending life of nuclear coolant systems and other hot areas.—Alcan International Company of America, 1501 Alcan Building, Pittsburgh 16, Pa.

Monolithic quad-diodestated electrical connector meets MIL-C-5015 AN "E" specification, looks without safety wiring, seals automatically and can be easily disassembled for correct installation and assembly. It has an operating range of -67° to +250° and a maximum current rating—Deutsch Co., 7000 Aviation Blvd., Los Angeles, Calif.

Safetywell thermocouple assembly has positive pressure seal to eliminate oxidation and ensure accuracy. Oper-

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the range of standard small-diameter hot-response units is from -various to 3,000°, and from -300° to +1,500°F. Heater wells can handle pressures to 20,000 psi.—*Thermal Corp.*, 7311 Sherman Drive, Buffalo 21, N.Y.

Electron diffractiongraph for structural research of materials, thin layers or surface taken samples as are selected for study at up to 1,000°C. Samples can be heated and rotated during check.—Boston Electronic Division, Natick-Kittery Corp., Natick and Union Sts., Boston, Mass.

Ultrasonic-transmission tester for detecting laminar flaws in metals and plastics, operating in bolts, braising fittings and similar discontinuities includes automatic handling accessories and a cooling device.—Shawm Ultrasonics, Inc., 518 Fairfield Ave., Stamford, Conn.

Horizontal test chamber has overhead opening door for insulation where there is no room for side-opening door. As a safety measure for the operator, air cylinder which raises or



lowers the door is counterbalanced so that in case of an failure, the door will not open at close from an position.—Amerson Research Corp., 11 Brook St., Bristol, Conn.

Centrifugal blowers and axial flow fans for electronic equipment are available in standardized sizes. Series PA-561 are direct-connected units producing up to 100 cu. ft. with static pressure of 1.5 in. Electronic Sales, Trade-Wind Motors Inc., Box 2735, Paramount Blvd., Raven, Calif.

Console form of instrument for calibration for environmental test equipment can be rotated to isolate it from dangerous areas.—Tronex Engineering, Inc., 1090 Springfield Rd., Union, N.J.

Portable test equipment to check and adjust overhead detectors, thermal switches, fire warning indicators, heater switches and other thermal equipment has temperature range of 200°F to

*This is no time for
SECOND GUESSING...*



These turboprop propeller blades

Model CT6545 of the Curtiss-Wright Turbomeca series was the first U.S.-designed and built turboprop propeller to be certified for commercial use by the Civil Aeronautics Administration. This model and others are already in quantity production for military aircraft.

Turboprop propellers are extruded hollow steel blades produced by the controlled extrusion process developed by Curtiss-Wright. The extruded blade begins as a single-piece alloy steel billet.

With the development of this propeller and the controlled extrusion process came the need to select the right alloy steel. And here's where Republic paid off.

Republic metallurgists, working closely with Curtiss-Wright metallurgists and engineers, selected an alloy steel with the following properties that make the extrusion process successful from both a production and cost standpoint: freedom from imperfections, uniform response to heat treatment, workability in all ranges, weldability, hardenability—hot or cold.

These properties in combination with the extrusion process give:

(1) **IMPROVED STRENGTH-WEIGHT RATIO.** The magik, longitudinal structure of the extruded alloy steel blade provides greater strength and resistance to fatigue with minimum weight.

(2) **IMPROVED QUALITY.** Greater uniformity is assured by fabricating from a single homogeneous material.

(3) **INCREASED PRODUCTION.** The number of manufacturing operations is reduced. Production per hour is increased. Floor space is saved.

(4) **REDUCED COST.** Less metal for original stock, less machining, and lower cost tooling and equipment are realized. Expensive welding and accompanying pre-heating and post-heating operations, as well as rolling operations, have been reduced.

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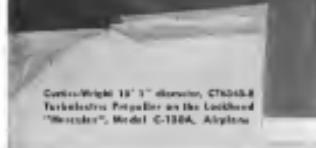


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Curtiss-Wright 18" 3" diameter, CT6545A
Turbopropeller Propeller on the Lockheed
"Westerland", Model C-138A, Airplane

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BUSINESS FLYING



LEARSTAR SALES are a big factor in building the firm's commercial dollar volume.

Lear Expects Commercial Sales To Overtake Military Business

By Erwin L. Balkan

Heavy demands for equipment by business aircraft operators are sending Lear, Inc. a commercial sales thrust sharply upward to the point where they represent an increasingly substantial share of the company's total business.

Dollar volume figures cannot be disclosed by Lear since terms of contracts signed by agency operators pending a public airing of the company's deliberations. The fact that Lear does not normally break down divisional operations is another factor that makes it difficult to arrive at sales figures. However, a check of percentages provides revealing information.

Learstar Sales Important

In 1955 Lear's business aircraft sales were some 16% of the company's total business, compared with about 8% for 1954. The company's dollar volume was even more impressive—industry analysts calculate that it increased to just under \$9 million and represented well over a 100% increase over the previous year.

A major factor in that gain undoubtedly was the company's venture into building business jetliners in addition to corporate. In 1955 it delivered a

down Learstar transports—a modernized, high-performance version of the popular Lockheed Lodestar. No Lear jets were delivered in 1954.

The company reports receipt of \$1.9 million in orders for the Learstar within the last 60 days. These include the first of the executive transports to be built at Lockheed's plant, and six in addition to the original 50 aircraft of Learstar already shipped.

The company says it has a list of "more dozen" of interested prospects for future sales.

Lear's Aircraft Engineering Division, Santa Monica, is experiencing a growing volume of pleasure inspection and training activity, including weather radar installations, as a result of Learstar sales. The division reports that the planes have accumulated more than 1 million miles of operation by corporate and air taxi fleet at the rate of 200,000 miles monthly.

Up by Loops

Corporate executives are convinced that future growth of business firms will be in large loops such insuring flying. They predict that within the next 10 years the corporate annual sales of airline and business planes will exceed military sales. They say that at some point, military sales will be confined to

replacement and improvement of a fixed-winged force whereas the business aircraft market is "virtually unlimited."

Indications of this trend have already begun. In 1954 jet over 3,000 turboprop aircraft were produced; in 1955 this number was manufactured at a rate of 400 aircraft. The jet in commercial planes was even more impressive; more than 500 jets were turned out last year compared to 350 in the previous year.

"There are a fine fury recently," Lear officials told Aviation Week, "when original performance has the triple threat of heating sales, strong point and service and maintenance convenience." That power has proved. The net is on to simultaneously enlarge their customer base and lower the per-mile cost of business air travel through improved design and equipment.

Package of Performance

"It is noteworthy that higher cost often has accompanied higher and faster," Lear says. "People seem to be learning fast that the combination of changes adds up a package of performance and that the cost of the resulting transportation per passenger mile is a blend of the package's added reliability, maintenance costs, speed, payload and fuel cost. Whether designed toward engine design or its equivalent, a quickie with first cost is usually a quickie with performance. The cost of air travel is paper prospectus sometimes becoming an almost negligible consideration, when operating costs are analyzed."

To underscore the point that corporate aircraft are being designed to extend the radius of their aircraft the unique note that is a single recent month it sold \$1 million worth of aircraft components to another aircraft manufacturer.

The company is turning as much as possible of research and development effort toward this market. It says that the whole lot of recent funds spent in the aircraft field, such as transistor and magnetic amplifiers, remains to be exploited soon for both, either than in just a few of the most obvious applications. "We can sell to the average the same technology and suddenly gain an advantage by using the future with the better tools than ever before."

Technological Genius

Officially replete that the tremendous technological gains made in aircraft equipment through military demands

will spill over in the design of new business aircraft products at an increasing rate. They can, for example, "We will be ready to start to introduce us, something concept basic aircraft and maintenance systems, which by the way, of course, will generate on less content than it takes to light the dust." Here and other areas products of companies, implementation are in the horizon flight test stage."

Among the projects in the works at Edo is further development of the Nifty (inertial flight instruments) concept which started with an attitude instrument IAW June 15, 1953, p. 45). In the year ahead we will bring out

other short reading instruments, showing normal calculations on the part of the pilot, especially with regard to air speed, altitude and the making of direct heading changes without the necessity for separate banking," the company reports.

Light 24-V. Battery

Edu strongly advocates development of a light aircraft battery of 24 volts so no increase in weight from the present 12-volt type still need by most small aircraft. "You should also the following important advantages:

* War of one-fourth the mass savings could be met, allowing substantial re-

duction in costs, weight and size of aircraft wing.

* Motors for light airplane requirements will be efficient because of reduced brush loss.

* Substantial improvement in efficiency will be obtained as devices required to provide lighting, such as 600-cycle electric and electronic power supplies, become the effects of brief duration cannot maintain are reduced to a factor of four.

* Higher efficiency of generators.

* Electronic equipment may be produced which will operate directly from the 24volt electrical system. Certain vacuum tubes will perform well with more potential of 24 volts. There are already many tubes available that will perform satisfactorily with more potential of only 12 volts. In case of power failure, while some will perform moderately on 12 volts, those same tubes will work much better on a 24 volt power source, Edu says.

* Standardization benefits, arising from use of a 24-volt system would permit electrical equipment manufacturers to buy larger quantities to produce a single voltage system and also reduce the cost of certain components by eliminating the need to make these items compatible with both 12 volt and 24 volt operation. The 12 volt furnish all of power transmission need with greater power supplies, the company points out.

NEWS NOTES

EDO-DEVELOPED HYDRO-SKI ON MARTIN PBM

Many years of development work by Edo on hydrofoil-type hydro-skis have paid off handsomely in the remarkable performance of the Martin PBM recently revealed by Glenn L. Martin Co. The hydro-ski installation on this aircraft, designed and built by Edo, has greatly extended the PBM's rough water capabilities.



First developed and exclusively installed by Edo under Navy contract, the hydro-skis give flying boat the capability of operating under open ocean conditions hitherto impossible.

The Edo-type hydro-skis, with its double-hull characteristics and on which Edo holds several patents, is equally applicable to very large, or very high performance aircraft whose gross weight or landing speed make the use of runways impractical.

For over 30 years Edo has pioneered in all things pertaining to the operation of water-borne aircraft. Now, more than ever before Edo is looked to for assistance in all forward-thinking ideas to employ the limitless capacities of water for faster, bigger aircraft now on the drawing board.



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Atlantic Aviation Expands, Reshuffles

Atlantic Aviation Service, Inc., plans to formally open a Skidoo base at Bangor at New Year's Day, according to W. E. Richards, Delta manager. Feb. 14, the date of the opening, is to be attended by the following business aviation figures including Mrs. O. A. Beck, president of Beech Aircraft Corp. and C. T. Piper, president of Piper Aircraft Corp.

The new hangar, costing some \$600,000, will double the operator's current facilities at the airport and is a major step in a large expansion program planned by the firm. Highlights of the opening will include a display of the latest Beech and Piper twin-engine planes, flight simulators and a special liaison desk arranged by W. E. Richards for the corporate executives' wives.

Further news, indicating Atlantic Aviation's increased activity in business flying, include a realignment of top-level executive responsibilities. Richards was made at a recent board of directors meeting that sales and operations functions of Atlantic Aviation's operations are being separated.

Stewart M. Ayres, formerly in charge

of sales and operations for Atlantic Aviation Service, Inc., Wilkes-Barre, is vice president sales of all the firm's activities covering seven states. W. E. Richards, formerly vice president sales and operations, Atlantic Aviation Corp., Tennessee, is now vice president operations of all the company's bases. Stewart Foulke is president.

Both of the Atlantic Aviation operations were among Beech aircraft on January selling over \$1 million worth of planes and parts last year (AVW, Dec. 26, 1953, p. 42).

Beech Reports 20% Increase in Backlog

An increase of almost 20% in contract backlog was reported by Beech Aircraft Corp., Wichita, in the first three months of its fiscal year for a total of \$76.2 million as of Dec. 31th.

An important segment of new Beech orders included two supplemental contracts from Lockheed Aircraft Corp. for more than \$6.5 million. One of these was for approximately \$1-million worth of 25-57 jet liaison aircraft, extending Beech's total backlog of this aircraft into 1957. The engines have been building there was originally only 1951 and delivered in 4800th set last March. The other contract, for \$3.5 million, was for T-28C wings.

Gross sales for the first fiscal quarter of 1954 totaled \$17,026,914.

PRIVATE LINES

PA-25 designation has been assigned the low-wing Ag-3 airplane that airplane developed by Fred Weick at Team A&M with assistance of Piper Aircraft Corp., which has been backing the project as a possible replacement for the PA-23. The Ag-3 is a single-seat aircraft of a design that does not mean that any production contract Weick has yet been made for the company, a source close to Piper notes. The Ag-3 now is at Lockheed Hangar undergoing evaluation at wing. Engine which the original plane did not have. It is third aircraft in agreement between Weick and Team A&M in late February.

Liquigation to allow contractors to build planes of their own design is being considered by the Australian Department of Civil Aviation.

Corporate aircraft interests booked through Beech Radio division in 1953 showed a 32% increase over 1952, the company reports. The radio division has set up a new division department in Baltimore, Md., under Clarence J. Rice to consolidate all of the company's aircraft acquisition activities, in-

BUSINESS AND UTILITY PLANE SHIPMENTS

January-December 1953

Business and utility airplane manufacturers reported a record-breaking dollar volume exceeding \$10 billion by shipping over 4,400 single and twin-engine aircraft in January-December 1953. Compared to 1952, figures in previous plane ship reports show a 14% increase in 1953. Total value of aircraft shipped in 1953 was \$47 million in 1952 and \$34 million in 1951. Total value of aircraft shipped in 1953 by which to measure the health of this industry. Delays of longer and heavier aircraft, often than price increases, were a major factor in the available aircraft trade. In 1953, over 800 aircraft were delivered, but only 700 aircraft were shipped. This means that the industry is reflected out into higher dollar value of aircraft, but across the board is increased sales, production and other equipment sales in addition to providing new revenue sources for the fixed-base operators in regards maintenance and overhaul.

	Corporate Aircraft Jan-Dec.	Utility Net Billing Price Jan-Dec.
Aero Design	48	\$3,030,400
SAC	31	—
SAC-A	9	—
Beech		
Beech 18-25	437	46
18-75	1	—
T-145	85	6
Translifter C30	131	11
Model 45 Tailor	36	—
Cessna		
Model ASA	—	—
Model AA	111	37
Model STP1	—	58,000
Cougar		
172	400	17
175	75	47
182	800	64
195	19	—
198	1	—
205	2	—
219	800	55
Monocoupe		
Monocoupe	28	1
MB-1C	5	3
MB-2B	—	162,150
Piper		
PA-25	605	19
PA-26 To-Fax	916	23
Apache	351	36
Taylorcraft		
Taylor 15A	4	—
Model 80	10	1
Totals	4,423	\$81,185,778

Source: Aircraft Industries Assoc., Utility Airplane Council and manufacturer's reports.
1. Cessna though November delivered one Model ASA, five AA and one STP1.
In December it delivered three airplanes, all models, a total of 11 for 1953.

leasing rates, manufacturing, quality control and purchasing.

Aircraft financial responsibility act has become effective in Massachusetts. Under an aircraft owner's pilot is fully liable or financially covered as event of an accident resulting in damage to aircraft, it will not be permitted to fly in the state and his license or place of birth will be grounded until the case is settled.

Plymouth Oil Co., San Antonio, Tex., has ordered the first Learjet Mk. I conversion on its extensive Learjet Modification schedule major network of the plane's wings, nacelles, landing gear

fairing nose and tail without disturbing interior arrangements. Learjet ML-2 has 200-230 mph. cruise speed, range of 2,950 mi. at 270 mph. and 1,330 hp per engine for takeoff.

One-eighth Gyr-copter B-7M was submitted to begin demonstration flights late last month at Bellanca-Douglas Air Park, North Hollywood, Calif. Robert A. Beck, president of Bellanca Aircraft Co., reports that the 15-ft. 8-in. B-7M will travel 20 mi. on a gallon of gasoline, seat six, cruising at 40 mph. It has a useful load fuel tank. The first will make the craft available to let down for approximately \$1,795 including its 40-lb. Nielsen mounted two-cycle power-

Eccosorb CH Microwave Absorber for Darkrooms



Microwave Darkroom with Emerson & Cuming Lighting Units under test

Eccosorb CH is a series of broadband absorbers reflecting less than 2% of the energy incident upon its surface. It is composed of extruded, ribbed foam and made in sheets 2 feet by 2 feet in various thicknesses. Eccosorb CH is light weight and flexible. It is easily mounted and is natural, while metallic colors give good light reflection.

Free Space Rooms are easily and economically built for indoor antenna measurements. Reflections are eliminated for all practical purposes. You can build your own microwave dark room or we offer you a complete Free Space Room ready to use. Emerson & Cuming engineers design and build special types for unusual conditions. Call us for specifications.

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plant. Construction plans call for \$35,000,000 that the firm has sold over 1,800 sets of plans of previous unpreserved Gyrogliders in the U.S. and abroad and that some 2,000 of these are under construction. He notes that the radio-controlled Gyroglider is available in 8-1500 pound configurations.

Fest Comptometer business plant built by Northern Aircraft, Inc., Alpena, Mich., is scheduled to fly about the first of June. Northern Aircraft purchased all production and rights to the plane from its original designer, Belmore Aircraft Corp., New Castle, Del., and began work of testing late last month. Northern Aircraft's Comptometer will be a modernized design extending the four-engine plane's range to 1,000 mi and aircraft speed with 1,025 lb of payload to 367 ft. The plane can be fitted with an auto-

Executive aircraft owners and two others are cooperating in construction of two hangars and facilities to cost over \$6 million at Cleveland Hopkins Airport, Ohio. Involved are United Air Lines and American Airlines. Republic Steel Corp., M. A. Hanna Co., Thompson Products Inc. and Standard Oil Co. (Ohio). The first flight of these firms are holding facilities to hangar and service their own planes. Standard Oil will build similar facilities to serve its aircraft and those of other companies based at the field. Work is to start in July and is scheduled to start October 1st, with completion planned in about 18 months.

Bell 47 helicopter helped string three miles of twin spans of 12,46 ft. and 3,175 ft. at Whidbey Island, Puget Sound, Washington. Care had to be taken not to allow the lines to sag in soft terrain, which would have swept them away.

Air Survey Co. has been awarded a contract by the Peruvian government to handle hydrographic mapping and use air to map planning, aerial and seaplane navigation, magnetic, radioelectric, photogrammetric, seismic and geological exploration. Contract valued at about \$70,000 was won in open international competition and is one of the largest ever awarded to a British firm. Air Survey is a subsidiary of Dowsy Aviation Co., Ltd.

New East distributor: Carolina Aircraft Sales, Charlotte, N. C., and Walker Aircraft Co., Inc., Somers, N.Y.

Fastest-sensitive tape designed primarily to reduce sound levels inside aircraft is reported to have dropping efficiencies of 42 db/sec./ft./sq. ft. at 90 F or 45.5 db/sec./ft./sq. ft. at 95 F.



British Test Farm Plane

New Zealand agricultural plane operators have ordered the new P-9 farm plane, being flight tested by Edge Flying Aviatrix, Ltd. The P-9 is the second new British agricultural airplane to begin tests recently, the other being the Astur Agriplane (AVN Dec. 26, 1951, p. 40). The P-9 features a pusher-type engine, liquid-cooled, with standard door providing access to the nose of the craft. Powered by a 277.5-hp. Lycoming G-600-8 engine, maximum speed is 110 mph. It takes off in 200 yards and has circular cross section wings with a 1,025 lb. of payload at 3,675 ft. The plane can be fitted with an auto-

ing indicators and other development agencies. The aircraft are operated by Auto Service Corp., Philadelphia, Pa.

Spar plug plane for business and private pilot considered by engineers of AC Spark Plug Divison, General Motors, has gone on a nationwide tour following keen interest shown at initial presentations in New York (AVN Dec. 5, 1951, p. 54). Sponsored by AC distribution, the tour reached Miami and Atlanta and has now reached the midwest, stops at Dallas, Tex., Wichita, Kansas, Oklahoma City, Houston and San Antonio in the next few days.



K1829-56 HC VALVE SEAT change features a shoulder and projects into place by a molecular bonding technique to hold it in place firmly. Modification, developed by Dowdell Bros. Inc., Geddes, Calif., is used in each industry at button-threaded seats to losses due to the severing pin. The modification for steel tips tested for 180 hr. and is approved by Civil Aeromotor Adhesive Division, Stoward-Davis says.

Two Lockheed P-86 combat planes are photo mapping Craft and the aircraft already have geologic studies and general reconnaissance by oil and natural gas companies.

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SAFETY

CAB Report on DC-3-Piper Accident

Vigilance Could Have Averted Collision

Two aircraft collided in the weather while both were approaching to land at the Las Cruces Airport, Hobbs, New Mexico, Aug. 28, 1957, about 1245.
One, a Convair Air Lines DC-3, N 21945, damaged but without impairment of control or injury to any occupant, was landed safely after a go-around.

The aircraft, a Hsues Feng Series single engine fighter TA-22, 24-31548B, plunged nose first to the runway, apparently leaving no pilot, the sole occupant. There was no fire.

Commented An East Texas pilot: "Flight 114 of April 29 originated at El Paso, Texas. It headed toward St. Louis. Stops were scheduled at Lubbock and Hobbs, New Mexico, and at Midland, Odessa, San Angelo and Austin. There, despite heavy El Paso rain, was an schedule at 12:30, with arrival at Lubbock at 1:30, and departure at 2:30. The flight was delayed by weather at Lubbock, and arrived at 12:45. Landing at Houston was at 1:17 on a VFR flight plan with a 100-mile radius. A crew of Captain B. F. Thompson, Captain Michael Edwards and Lieutenant George McDonald. At liftoff the gross weight of 25,173 pounds and the center of gravity were within prescribed limits."

Flight Officer Edwards, flying the aircraft, a Boeing 747-100, departed Wichita, Kansas, at approximately 0916. The aircraft was properly loaded in respect to weight and center of gravity.

Cochrane (Holden segment) of CAF, Flight 114 from the right seat with Captain Thompson on the left, acting as co-pilot. Team Craft had the flight planned generally at a crossing altitude of 5,000 feet in 1+1 excellent weather.

and, since there was no evident lower at the report, imagined there was no local traffic. The station stopped, walked and looked, saw none, and advised that there was none visible from the terminal. The pilot accomplished the emergency checklist before the contact.

Captain Thompson then advised First Officer Fabreys to fly south (in the left) of the course so as to be in position by a right turn to a base leg of a left-hand traffic pattern. Accordingly, when approximately 1/4 miles from the airport the first officer turned right in a heading of 120°.

Upon striking a base leg for runway 3 he maintained an altitude of 4,500 feet at a 1, about 540 feet above the ground, while on the base leg. The airport is at an elevation of 4,000 feet m.s.l.

A left turn from base to final for runway 3 was made approximately 21 miles east and about 800 feet above the ground, at which time the landing gear was deployed.

back into the landing gear was lowered, the quantity drops were applied, and the main landing skidshoe was strengthened by cross-ties. The rate and roll-off drops were applied. At one-half mile out the drops were applied fully at an angle of 44

Captain Thomas Miller, the senior pilot with each of the three planes, and his aircraft crossed the field boundary at 80 mph.

Hubb CAA said today giving the requested information adding that he had found issues 1 and 2 exists, certain

Since $\text{O}_2 \rightarrow \text{O}_3$ are correlated processes, the two curves of 20 seconds, and 10 minutes, respectively, feature addition, and hence, the corresponding reaction curves of 20 seconds and 10 minutes for the Pfeffer and the EC-3 respectively.

MILITARY AIRLINE REG. NO.		LEIA COUNTY AIRPORT HOBBS, N.M.	
		AIR COLLISION BETWEEN CONTINENTAL AIR LINES 30-3 N83948 and KIMES FLYING SERVICE PIPER N103948 WEDNESDAY 25 MAY 1955	
DETAILED INFORMATION			

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SAFETY

horse of men and equipment on the ground. That contact was made while the Piper was an measured five miles north east of the impact at an altitude of 4,200 feet ± 1.

Ardous acknowledged the damage and continued flying until the impact. He had been flying northward, slightly to the left in order to enter the turnout pattern on a downward leg by his memory. "Then leg was down at an altitude of approximately 4,200 feet ± 1, 200 feet above the ground, about one-half mile to the south of a rock cut in the side of the mountain," he said.

With Ardous steering the plane while the downward leg, he looked up often to the right, establishing a line of sight along the mountain, and then checked the area for other planes. "None was seen," (During that period he lowered the flap lever switch.)

Collision Near Ground

The M-300 in flight was steepened and at an altitude of approximately 50 knots, full flap, in the climb mode, were applied. At the approach end of runway 5, Ardous noted that he was too high and started a turn to his left, which had cleared the mountain. At that time he was between 41 and 35 knots.

Just after passing the end of the runway Ardous heard a loud roar. He glanced out of the right window and saw the nose of another aircraft coming toward him in a collision course. At this point the two aircraft collided and the Piper crashed to runway 3 more than 50 feet from its approach end. The time of collision was approximately 1745 and the altitude was 50-60 feet.

INVESTIGATION

The official investigator at the airport is less inclined to believe that the accident occurred as Cushing estimated. The broken broken glass at 7500' probably includes glass from the cockpit windows of the Piper. The sun was possibly visible in a compass direction above the horizon and its position was being used as a reference point of orientation by the untrained Ardous. The Piper was painted cream and brown; the DC-3 was painted aluminum with white and blue trim. The planes of both aircraft reflected that the respective wavelengths were close.

Reconstruction Study

Impact was between the left propeller of the DC-3 and the empennage of the Piper. It was possible to reconstruct partially the actual impact sequence of the Piper by matching parts and pieces of uprooted foliage against a metal surface.

Upon examination the first propeller blade contact out of the wreckage left on the trailing edge of the rudder. Subsequent propeller cuts sheared through the rudder and rudder control hardware and finally through the rudder and stabilizer, and finally to the rear of the tail fin. The tail fin was broken off at the top of the rudder post. The rudder and tail section were quite intact, nearly parallel, and sufficiently oriented in relation to allow a comparison of the difference in speeds of the two aircraft. The engine of the DC-3 was at a probable speed of about 2,700 rpm, and the difference in the horizontal velocity

components of the two speeds was apparently 35 knots, the DC-3 traveling faster. The angles of the propeller cuts relative to the longitudinal axis of the Piper indicated an angle of attack of the rear aircraft at the time of and for a very brief period immediately following the impact.

The longitudinal axis of the Piper was angled about 7 degrees to the left and about 7 degrees below the horizontal for the longitudinal leg by the DC-3. The Piper was headed to the left (the DC-3 was level laterally) by an amount not readily determinable from the main bar, or rudder, as the Piper plane intersects the bar at 10 degrees and the cockpit inclination at 11 degrees.

At the moment of first contact the left propeller hub of the DC-3 was about three feet from the bottom of the rudder and about one-half foot left of the centerline of the Piper.

Change in the DC-3 was caused by small amounts of force from the impact of the Piper propeller blades on the left side propeller of the DC-3. Some of these forces propagated the denting and ripped clothing that was hanging just behind the cockpit but most of the damage was not altered. The left propeller bore deep marks of impact.

Continental's Manual

Continental Aviation Operations Manual provides that all unenclosed or parts approaching flight deck should contain a base leg prior to starting final in order to observe other traffic more adequately. The DC-3 pilots realized that they continued straight in their approach to the runway, past the approach end and flew to the left in order to establish a base leg. Their treatment was justified by general wartime.

The Piper approached the impact from a direction substantially opposite that of our way. It was to the right, however, that ran away. It ran away from the downward leg or a direction approximately opposite runway 3 to a point about ahead of its approach end. Consequently approximately 120 degrees of left turn was necessary to align with that runway.

The Piper's instrument panel instrumentation indicates that this turn was initiated no earlier than with the recent lasted appreciable throughout the turn. It also indicates that the Piper was the higher of the two aircraft at both approached the runway 3 and at the point where the flight and landing began. The Piper at a right sharp left turn merging into a left forward leg run before collision.

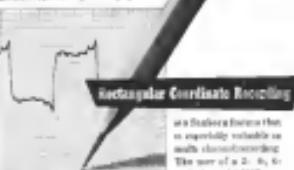
These flight paths were confirmed firmly after the accident by general observation of aircraft approach patterns of two aircraft in early 1957 (Ref. 1, Appendix A).

At 1737 the DC-3 departed to an emergency radio station at the airport. At 1739 the Piper departed to the Hilo CAA radio. The CAA radiomen and the CAL operator, in separated offices in the same building, did not exchange their respective details of traffic information.

Local Traffic Rule

Airport authorities had published local traffic rules accompanied by the convex (left-hand traffic) diagram several years

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rules. These rules and designs had been with CAA acceptance research as they had originally been submitted to the CAA, and had been passed comparatively at the first port.

Pilot Anthony testified that he was familiar with the new aircraft and its operation. This particular aircraft had landed at Los Angeles Airport and was on March 21, 1951, in compliance with company approach procedures, which were issued with local traffic rules.

The Los Angeles Airport is an IFR jet base and has no visual reference to return to in case of failure. The two aircraft involved were the only two in the area at the time and place of the accident.

ANALYSIS

Regardless of the numerous devices and instruments available to the pilot and designer that have been devised to keep him safe, nothing as yet has replicated fully the cardinal principle of seeing and being seen. That responsibility rests in cockpit.

At uncontrolled airports such as Los Angeles, the principle of "see and be seen" becomes even more important.

Experience has well demonstrated that the approach end of a runway is most critical to safety of the local pilot of planes. There are two Civil Air Regulations that are pertinent to this collision:

It is obvious that off alignment of the ground surface by the pilot could have resulted in fatal accident. It is also clear that neither pilot did as the other's or craft would likely have been lost before collision.

The DC-3 was flown in such a manner that the Tiger could have been within

400-LI CARGOLESS OR AIRCRAFT OPERATOR

...or pilot could conceive an attitude in an airplane or reaction situation so as to damage the life or property of others.

It is logical to assume that the pilot in charge of an aircraft makes no mistake. In this instance, the pilot went above the speed limit of 100 mph and descended below the ground surface in flight.

100 MPH OVERSTATED

An airplane that is being accelerated has the right of way over all other aircraft, including those descending, or in level flight. This shall be true of the way the pilot in command of the aircraft can control the rate and direction of descent in the event of an emergency situation. In the event of a collision of the two aircraft, the pilot in command of the aircraft that has descended shall be entirely fault and share 100% responsibility for an acceleration moment on the part of the other aircraft.

It is also logical to assume that the pilot in charge of the aircraft that was flying at 100 mph in excess of the speed limit, was performing at 100% of his maximum ability when placing the mounting aircraft in an attitude

100 MPH

above the ground surface, in order to maintain the altitude of the aircraft, and to other aircraft in flight or approaching the same altitude. This is a normal procedure for the avoidance of crashing into another aircraft at the same altitude.

It may not be a coincidence that the pilot in charge of the aircraft that was flying at 100 mph in excess of the speed limit, was flying at 100% of his maximum ability to maintain the altitude of the aircraft.

POSSIBLE OTHER CAUSES RECOGNIZED THAT ARE CONSIDERED AS POSSIBLE TO EXPLAIN THE CRASH ARE: (1) THE PILOT OF THE AIRCRAFT WITH THE HIGH SPEED AND LOW ALTITUDE WAS INFLUENCED BY THE AIRCRAFT WHICH WAS DESCENDING WITH THE HIGH SPEED AND THEREFORE UNINTENTIONAL APPROXIMATION OF SPEED WAS INEXTRICABLE IN THE MANNER OF THE ACCIDENT.

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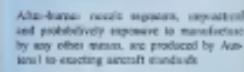


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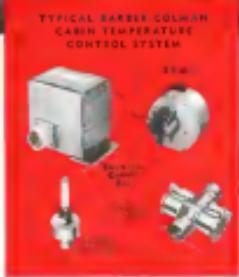


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SAFETY

use from the DC-3 except for a relative tail race interval until very shortly before the collision.

The Piper was flying in such a manner that the DC-3 should have been able to land at a safe distance if a clear period just before the crash had made it a non-factor less than diminished. Staff: The Piper is a high-wing aircraft and, although the right wing itself would not block major traffic, both the tail and the engine were positioned in the line of sight toward the DC-3 to the right, and as the Piper was the higher of the two aircraft during the final part of the approach, the difference in altitude must have lengthened considerably any potential reaction time of the controller of the other aircraft field of vision over the path of the aircraft intended. Also, under the conditions of being in a forced climb to low altitude and then land short, altitude must certainly have been losing about ten thousand feet.

The point of me and my wife engineer that under conditions of visibility in which pilots can see other aircraft sufficiently to provide adequate traffic separation, pilots must assume complete responsibility against collision.

Not Vigilant Enough

It is obvious that had either the pilot of the DC-3 or the pilot of the Piper seen and the maximum vigilance required by VFR flight during landing approach, the other aircraft would have been seen in time to avoid accident.

The following therefore conclude that neither pilot was sufficiently vigilant and that the Piper was not aware to full consciousness with the impact traffic pattern.

It is probably true that the extremely heavy load of an engine at Hobbs Airport and the fact that neither aircraft was armed with the ability to power may have lessened the pilot's alertness.

As a result of this accident an extensive investigation has been conducted by twice Dornierstadt's radio crews and the GATX radio office to see if all traffic information can be quickly available to both

FINDINGS

On the basis of all available evidence the Board finds that:

1. The carrier, both aircraft and all three pilots were properly certificated.

2. Neither weather nor the position of the sun was a factor.

3. The DC-3 was down in accordance with standard instrument requirements and the local traffic rules.

4. The Piper was not flown as a visual and with the local traffic rules.

5. There was an appreciable period during the final approach of the DC-3 when the Piper could and did not have less than ten feet from the DC-3.

6. Throughout the greater part of the approach of the Piper, the DC-3 could and should have been seen from the Piper

or both aircraft, and failure of the Piper pilot to comply fully with the local traffic pattern.

By the Civil Aviation Board:
Russ Riley
Joseph P. Adams
Chris Conner
Henry D. Drury

SUPPLEMENTAL DATA

The Civil Aviation Board was established by the President of the United States by Executive Order 10364 on August 23, 1938.

Its incorporation was immediately started in accordance with the provisions of the Civil Aviation Act of 1934, as amended. A public hearing was convened by the Board and was held in Hobbs, New Mexico, October 17, 1939.

Air Carrier and Pipe Operator

Continental Air Lines, Inc., a Nevada corporation, has principal offices at Denver, Colorado. The company holds a current certificate of public convenience and necessity issued by the Civil Aviation Board to provide transportation of persons, property, and mail over a number of routes, including the route over which this accident occurred. Continental Air Lines, Inc., also holds a valid air carrier operating certificate issued by the Civil Aviation Administration.

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SAFETY

popular pastime. The flight involved in the accident was returning from a refueling stop at Camp John C. Frémont, Nev., approximately Continental Air Lines is a pilot on April 1, 1958. He holds a valid commercial certificate with an instrument rating and type rating for DC-3 aircraft. Captain Thompson had accumulated 2,400 hours of flying time, 2,000 of which 900 were accrued on DC-3 equipment. He last received physical examination was passed on June 27, 1958, and his last medical check including Lab County Airport was on March 21, 1958.

First Officer Monroe Edwards, age 24, was born in Los Angeles, Calif., and became a pilot on June 25, 1955. He holds a valid commercial certificate with instrument pilot, airplane single and multiengine, and instrument ratings. Mr. Edwards has accumulated 1,000 hours of flying time, 800 of which 300 were accrued on DC-3 equipment. His last physical examination was passed on July 23, 1955.

Stewardess Patricia McDonald was employed by Continental Air Lines, Inc., on April 1, 1957. Her training was completed June 15, 1957, and she was assigned to flight duty on June 29, 1957.

Pilot Orlin Dickey Anderson, age 22, started his flight instruction with the Human Flying Service on August 12, 1951. He is rated in instrument pilot rating on September 13, 1954, and was then employed as a flight instructor with the Human Flying Service for a total of 495 flight hours, which includes 50 hours of T-33 jet time and 105 hours of T-33 and AT-6 time in the AFIRBETZ. His instrument certificate was current and listed no waivers.

The Aircraft

No 11095, a Douglas DC-3, serial number 2155, made its first flight on Continental Air Lines on April 29, 1952. It had a total service time of 50,017 hours and 386 hours over engine overhaul.

The aircraft was equipped with Pratt and Whitney R-2820-14 engines and Hamilton Standard model 230E11 propellers. Total time since new on the left and right engine was 301 and 311 hours, respectively. Total time on the propellers was 12,581 and 14,286 hours, respectively, time since new on the propellers was 1,366 and 212 hours.

No 11148, a Piper PA-32-450, serial number 11148, owned by the Human Flying Service, was manufactured on April 8, 1955. Total time on the aircraft and engine was 1,200 hours. The aircraft was equipped with a Lycoming O-360-D2 engine, serial number 7329-12. The last annual inspection was April 26, 1958.

Flight Safety Foundation Distributes New Report

Based on the Waka, a report distributed by Flight Safety Foundation, deals with designs of drag behind jets and large aircraft or passing through them, making violent vertical accelerations except in a theoretical Analysis of Large Plane Landing and Takeoff Accidents Due to Encountering the Waves of Large Airplanes.¹

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U.S. Navy T2V-1 SeaStar Jet Trainer

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British Program Super Britannia Subsidy

Convair, Canadiana eliminated from plans to build turboprop in British move to compete with U. S.

London—The British government plans to spend at least \$30 million for the development of a Super Britannia turboprop transport designed to challenge the now for leading load of the United States in the jet market field.

The decision eliminates the planned participation of Canadair and Convair in the Super Britannia project (AW Nov. 14, p. 147). Apparently government leaders feel that any participation by General Dynamics Corp. would assist the English in capturing the place it held in the world transport market before the Comet's fall.

Plans call for the organization of a coalition of three or four leading British firms to step up the production and delivery dates of the Bristol-designed turboprop.

Comet IV Cancelled?

It also is possible that the Comet IV project may be canceled and the Handley Page HPR-1000 will be the only one built. We shall have to keep our eye on the projected Comet IV, and we fully realize how much time has been elapsed since the record world tour of its Comet III prototype. The Comet also would have less than 100 miles to challenge U. S. jets on blue ribbon, nonstop North Atlantic flights.

Under the earlier Bristol-Canadair-Canaer plan, the production goal called for deliveries to begin in 1969 when U. S. and British jet transports potentially should be in the skies. Now, delivery problems will be delayed to 1971.

The advanced version of the turbo prop also was to have had, and presumably will have, approximately the same speed as that of pure jet aircraft: 500 miles and carry 150 passengers or 20,000 lb. It was a maximum range of 1,100 miles.

The planned powerplant is the new Bristol BE 135 turboprop engine, an adaptation of the Olympus pure jet Bristol's designation for the aircraft in type 187.

The decision that Britain alone will develop the Super Britannia apparently was reached at cabinet level. Once enough production has been achieved to exploit the aircraft as a British aircraft, production rights will be offered to both Canadair and Convair.

The two companies were initially called into the project because it went well beyond the resources of Bristol. The government already had evaluated the design to offset this.

Both Bristol and the government are banking for success in the tough competition.

Comet II Fails Test

London—The wing component of the de Havilland Comet II jet transport failed after 15,000 hr of simulated flight at the company's tank at Hatfield. A de Havilland spokesman said, however, that delivery of twelve Comets II already scheduled by the Royal Air Force will not be delayed. The wing had safely completed the number of hours required by the R.A.F. contract.

Flight with Douglas DC-9 and Boeing 727 jet transports last weekend, plus Convair CV-990, on the Super Britannia's longer range, the current aircraft problem of the pure jets and the fact that the turboprop could operate from all existing major airports.

Delivery Schedules

Peter G. Mischell, managing director of Bristol Aeroplane Co. and former chief executive of British European Airways, said that once delivery dates are determined for the transatlantic, they will be issued.

If customary procedure is followed under the plan, the Ministry of Supply will give Bristol a multi-million-dollar development contract calling for the delivery of several prototypes. The money thus would be repaid to the ministry from the airlines' commercial sales.

Washington—A solution to the present problem of air traffic congestion is now being sought in an atmosphere of pessimism.

Failure of mutual recognition and general understanding of the seriousness of the situation has hampered results of both international conferences within Government and industry and between civil and military interests over air traffic control problems.

Congestion and congestion are seen the worldwide. This was sharply demonstrated at the two-day Jet Age Conference here last week. The leading subject was the need for immediate improvement in the present air traffic control system and planning for long-range improvements, because of the increase of military jets and the availability of commercial jets in the next few years.

More than 1,500 aviation experts attended the ATC sessions to hear speakers who spoke with confidence that aviation's number one problem can and will be solved. It was obvious that there is a common desire to solve the problem.

ABMIBETTLY LAGGING in turbine drugs, Britain is making a strong bid for a large share of the engine market. Pictured here is a Convair 340 converted to Napier Eland turboprop. It made its first flight last week. Napier, hoping to surpass the sales of the remainder of its program, says the shift uses 2,200 lb. in weight, boosts takeoff power and load capacity and lowers the noise level.



Vickers Viscount, Britain's Best for U. S.

Vickers Avastrutte's decision of its entire No. 1 production line at Hatfield in support of Capital Airlines' Viscount turboprop transports underscores Britain's efforts to snap up overseas gains from the few volume types it now has available to offer the world market. The company's No. 2 line is turning out Viscounts for Latin American Venezuela, Mexico, Trans-Canada Air Lines and Central African Airlines.

Air Congestion Accepted as a Problem

By Preble Staver

Washington—A solution to the present problem of air traffic congestion is now being sought in an atmosphere of pessimism.

Failure of mutual recognition and general understanding of the seriousness of the situation has hampered results of both recent positive actions:

• Change in philosophy of operation by the Civil Aeronautics Administration.

• Decree of President Eisenhower to implement a study of long-range transportation needs recommended by the Budget Bureau's Aviation Facilities Study Group.

• An coordinating Committee approval of a CAA Fiscal Federal Affairs Plan budget request to Congress for fiscal year 1957.

• Joint action by Commerce and Defense Departments in evaluating the potential application of SAGE (intercontinental aerial command) to air traffic control.

CAA is prepared to move traffic control into the jet age immediately, according to Charles J. Lowen, CAA Administrator. The first step, he said,

will be to begin controlling all airspace above 24,000 feet, where civil jets will soon add their numbers to high altitude military jet traffic.

The CAA's five-year plan, which calls for an orderly development of air navigation and traffic control facilities, begins with the fiscal 1957 budget request of \$40 million for new installations. Lower

CAA is the Jet Age

He and three things must be accomplished first to provide high altitude control:

• Extension of direct controller-pilot communications facilities (see p. 61).

• Improvement of equipment for displaying traffic data to control centers.

• Installation of additional landing aids.

Full Air Force support for the CAA's five-year plan was expressed by Maj. Gen. Edward T. Barron, USAF Director of Operations. He had no plain talk in the right direction. He stressed a series of close working relations with CAA and a continued willingness by the Air Force to assist in any and all efforts to im-



ABMIBETTLY LAGGING in turbine drugs, Britain is making a strong bid for a large share of the engine market. Pictured here is a Convair 340 converted to Napier Eland turboprop. It made its first flight last week. Napier, hoping to surpass the sales of the remainder of its program, says the shift uses 2,200 lb. in weight, boosts takeoff power and load capacity and lowers the noise level.

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He and he had thought that Lee "had treated their discussions."

Rothschild pointed out, however, that when the House of Representatives cut CAA's budget for fiscal 1955, Lee proposed on his own to reduce the authority by eliminating the radio clause.

Lee took this portion of budget language before a Senate Appropriations Subcommittee (AW June 15, p. 136).

It was at the Senate hearings last spring that the breach between Rothschild and Lee became apparent. Rothschild at that time announced the reinstatement of a deputy administrator for CAA, an action strongly opposed by Lee.

The situation continued less than six months later with Lee's dismissal, when Senator Mansfield tried to introduce his bill to sever CAA from the Department of Commerce.

After six weeks of hearings on the separation legislation, with about half the time devoted to investigating Lee's fraud, Mansfield now claims no unusual support.

Except for the Commerce Department's strong opposition, Mansfield told Rothschild all segments of aviation—with perhaps the exception of the organization of large truck associations—support a separation of CAA.

Industry Support

"I know that all of the truck lines are not in sympathy with the position taken by the Air Transport Assn.," Sen. Mansfield said.

"All aviation interests are supporting the bill, with the possible exception of those preparing to represent the large truckers, and I am supporting it closely." (See box, p. 105.)

Mansfield declared that the bill's supporters "seem to be willing to accept the loss of cabinet-level representation and the loss of the CAA name rather than to split up a new agency under the direction of someone who is interested in aviation development."

Indian Bilateral Pact Restricts Operations of American Carriers

Washington—A new bilateral agreement has been signed with India since more than two years of negotiation between the State Department and the Indian government. The pact contains extensive restrictions on the operations of American airlines through India.

The governments have settled on a new exchange of routes between the two countries and established an intricate system for coordination of flight frequencies. The plan will affect the operations of Pan Am, Trans World Airlines and Pan American World Airways will be allowed to operate the same number of flights as India by under a temporary permit.

Signings of the document ended a long, difficult negotiation which followed an Indian decision to cancel the original bilateral. While the agreement follows the general lines of the December-type bilateral, the capacity provisions demand in the agreement itself and in accompanying notes are more specific than those in other bilateral agreements.

Negotiations opened on these routes in 1952 or 1953, easier from the U.S. via Ceylon, Ireland, United Kingdom, Europe, Africa and Asia to Indonesia, Europe and Asia in Delta/Caledonia and beyond to points in Burma and Thailand, and beyond to the United States via various routes.

For an American carrier from the U.S. via Canada, Ireland, United Kingdom, Europe, Africa and Asia to Bangkok/Cambodia and beyond to Ceylon, Burma, Thailand and beyond to the United States via various routes.

For an Indian carrier from India via Asia, Africa, Europe, United Kingdom, Ireland and Canada to New York and the United States via various routes in each point originally agreed upon.

For an Indian carrier from India via Asia, the Philippines, Japan and Canada

to either Sri Lanka or Los Angeles, and beyond to points on the west coast, to or seek points mutually agreed upon in the future.

Under the agreement, an airline of one country can make only one traffic stop in the other country. When the Indian airline decides to start service to the United States, it will have to make a separate choice between San Francisco and Los Angeles for its West Coast port.

The original U. S.-Sikhs bilateral was signed in 1946. Under it, TWA and Pan American were restricted to and through India, a key route on transport routes between East and West. In 1953, India became increasingly disturbed over the competition for traffic to Europe that Ameristar carriers offered the government-owned Air India. This resulted.

In January of 1954, India told the State Department it was revoking the bilateral, effective January, 1955. Although negotiations to renew the old deal between the countries, but they were unsuccessful, and the agreement lapsed a year ago. Since then, TWA and Pan American have operated on a temporary permit limiting each of them to two flights a week to a single Indian point.

Last fall negotiations were resumed, and the new bilateral was signed Feb. 3. In a note exchanged at the same time, the U.S. Embassy pointed out that major problems between the countries are the great geographic differences between them, the fact that the Indian doesn't speak to the United States. The distance factor complicates the matter because it causes PAA and TWA to carry substantial extra fuel economy on flights between the U.S. and India, competing with Air India. The fact that an Indian carrier flies to the U.S. through such an American airport as Atlanta means that American engineers had nothing of economic value to trade in beginning for important routes for U.S. airlines in India.

The agreement and the way we are going to implement it are very much like the old one, and the overall and economic development of both the Indian and United States services. Capacity allowed on schedules is supposed to be based on traffic needs between the two countries.

Methods to increase capacity are provided through a variety of options and combinations based on principles of established traffic needs. The State Department thinks that the agreement provides a base for expansion of service, although admittedly it is a very approach.

Hughes Orders 707s for TWA

TWA World Airlines' share of the Boeing 707 Strengthener for its robust open-hold fleet has been increased by Harry F. Hughes.

Pratt & Whitney Co. has ordered eight 707-120 transports and will begin their delivery to TWA. Delivery of the long-haul jets with Pratt & Whitney engines will start in mid-1959. The 707 will be introduced by TWA to the west five months earlier than the 707-100 aircraft.

The TWA order complements the commitments of the Big Four, since American Airlines has ordered Boeing 707s and United Air Lines has ordered Douglas DC-8s. TWA will compete with American's Boeing and United's DC-8 in trans-continental routes.

The eight aircraft cost \$45 million each and are scheduled for delivery during April, May, June, July and August of 1959—delivery dates slightly comparable to those of the other three big jets.

The TWA Boeing will be equipped with Pratt and Whitney engines and will have major airframes.



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CAB Refuses North Atlantic Fare Hike, Criticizes Tourist Policies

Washington—The Civil Aeronautics Board has refused to approve a proposed 10% increase in North Atlantic fares and has increased the present maximum fares of other air routes.

The Board rejected an Interairless Air Transport Association proposal made at the Miami Trade Conference last fall, which raised fares from 10% on North Atlantic routes.

The fare increase was to be effective Aug. 1.

In view of the generally high load factors and the adequate level of earnings presently being realized from operations on the North Atlantic, any enlargement in the fare structure which results in an increase in the overall revenue to the carriers must be justified entirely on the merit and cost.

The proposed increases are considered consistent with the cost of the service involved, the CAB said. Costs of first class services have risen in recent accommodations and other rates have likewise become standard for the service. The Board favors a surcharge for deplaned-out accommodations.

The CAB's argument is that an increase in first class fares should be offset with a cut in tourist fares so that the general low level will remain the same.

The Board feels that current tourist fares are too high in relation to the cost of the service. The IATA tourist fares were approved until Dec. 31, 1956, and the CAB said the airlines had to re-examine fare levels and consider the apparent imbalance between first class and tourist fares.

Approval was also denied for a trans Pacific fare increase, the Board found that at no present and far in the future was delivery on proposed paid fares between Europe and Tokyo with a view to meeting the Japanese market. The CAB said the proposed fares would add to the world-wide fare structure.

Disagreement with the fare policy of IATA services was expressed at the IATA Annual General Meeting last October by CAB Chairman Roy Bailey.

He and then he was disappointed at the decision to raise first class fares and pointed to the success of U. S. domestic airlines with the new \$500 basic fare. Roy predicted that the public eventually would be won over to the new fares.

In its decision, the CAB said it believed that tourist fares are too high for a standard of service designed in a mass transportation medium. The folio is to provide an economical high-density trans-

Atlantic interlineage service between South America and the United States.

The CAB felt that the key factor in high tourist cost is an unacceptably low maximum seating density in tourist aircraft.

The Board Board is of the opinion that action be taken at the next conference meeting to modify seating densities and other tourist standards so that costs can be reduced and lower fares made available.

CAB Orders

(See Feb. 1)

GRANTER

Authorization to operate under specified military contracts in Capital Airlines, Over Seas National Airways, Milk Airways, Trans Air Lines, the Flying Tiger Line, Southeastern and Western Airlines, Coastal Air Transport, and the American Air Service Marine Air Transport. Permits for Transocean and North American Airlines between July 1 and June 30, 1958.

Flying Tiger Line is granted to perform a charter flight from Africa to New York pursuant to a request by the International Committee for European Migration Decision on 151 other ICM Rights.

Approval by Flying Tiger was deferred. Lease to intervene in the Syracuse-New York City case to the Syracuse Chamber of Commerce.

Suburban and Western Airlines are granted to perform a charter flight from Boston to Minneapolis, Minn., pursuant to an agreement with the Interim Government Commission for European Migration.

Lease to intervene in the matter of Trans Air Lines, Inc., General Director, one to American Airlines, Delta Air Lines, Eastern Air Lines, Lake Central Airlines, National Airlines, Northwest Airlines, the Pan Am Lines, TWA, the City of Colorado Springs, Colorado Chamber of Commerce, the City of Denver and the Denver Chamber of Commerce, the City of Detroit and the Detroit Board of Commerce, and the City of Toledo and the Toledo Chamber of Commerce. Permits for lease to intervene by various cities and regional transportation districts.

Part of New York Airports lease to intervene in the Syracuse-New York City case.

Lease to intervene in the Florida Cities service one to the City of Pensacola and the Pensacola Chamber of Commerce.

APPROVED:

Introducing relationships between Charles E. Vela, former Air Traffic Cop and the Midwest Motor Car Company.

Agreements involving Lake Central Airlines, Ozark Air Lines and various other companies relating to interline arrangements.

Suspension of the Board Airways-United Airlines interlineage service between South America and the United States.

Air Lines interlineage service between South America and the United States.

Agreements between Pan American World Airways, Air France and British European Airways relating to air service between the two and certain cities in the Federal West German Republic.

CORRIDED

Suspension of a Northwest Airlines proposal to Abolish round-trip services with aircraft having passenger seats extended to May 1, 1958, to allow added time for investigation. Northwest Airlines said it has been informed that the Board has decided to be based on this same date for the period starting April 1, 1958.

Transocean certificate modified and rescheduled for further hearing and revision on the issue of the American Air Service application to operate over the present eastern route. The action was taken after Pan American Handbooks asked the Board to review its earlier decision in the case.

Authorizations for truck and bus services to distant stations for the so-called "over-the-road" drivers and bus drivers to allow continuation of the Airline Conference meetings in May.

DIMINISHED

Complaint of the Orlando Chamber of Commerce and Board of Trade concerning discontinuance of service by American Airlines, United Air Lines, Trans World Airlines and Western Air Lines at the request of the two performing corporations.

Application of Pan American Air Lines and S. L. Wilson for amendment of interlocking relationship between the two has been denied.

Application of Trans World Airlines and Mid-Continent Airlines for approval of an interchange, at the request of TWA and Eastern Airlines.

DENIED

National Airlines' application for exemption authority to continue the operation of certain Capital System interlineage flights, since Capital Airlines has arranged to assume the service by March 1, 1958.

Martin Breaks Ground For Denver Plant

Ground breaking for a \$35 million plant, planned to make an intercontinental jetliners, will begin, took place early this month by Cleon L. Martin Co. on a 4,000 acre site near Denver, Colo. The plant is scheduled for completion by Nov. 1, with USAF giving the go-ahead top priority. Production will begin within 12 months after construction is finished.

Martin has signed an agreement with Colorado Central Power Co. to supply 30,000 kw. of electrical power to the plant. The plant will be built in two phases. Martin's Baltimore headquarters to provide a major staff for the new facility (AW Dec. 5, 1955, p. 16). About 5,000 persons are expected to be employed at Denver within five years with a payroll of about \$20 million.



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Shortlines

► Allegheny Airlines and Michael Airlines have installed an automatic telephone system at their joint facility in New York's West Side Airlines Terminal. The system, which automatically routes incoming calls to reservation agents, can handle 4,000 calls a day and is expandable to a capacity of 8,000 daily calls.

► British Airways has an alliance with British Overseas Airways Corporation to operate British's Delta New York, which connects with its own nonstop flight will be scheduled from Newark Airport to Idlewild by New York Airways.

► British European Airways carried more than 2,900,000 passengers last year, a 27% increase in traffic. Revenue reached more than \$50 million. In January, BEA joined the millionaire mark with its Vickers aircraft.

► Canadian Air Transport Board has licensed non-scheduled charters service for Contractors' Yield Airlines to operate from Johnson, El., to points in Ontario, Quebec and Newfoundland. License of Vincent Atter to operate from Teterboro, N. J., and of Northern Shrike Air Transport Service to operate from Spokane, Wash., were removed for three years.

► Delta Air Lines has bought four Constellations from Pan American World Airways. No price was announced for the deal, which included leases. Delta has 10 DC-8s and six Convair 990s on order.

► Sabena, the Belgian airline, is offering non-scheduled passenger flights to four European destinations this spring from New York. The first trip leaves April 22 to June 5 and costs \$1,510; the second is from April 22 to May 18, costing \$1,110.

► Lockheed Atlantic Service International aircraft deliveries rose to 2,995 last year, 58% more than 1954 production.

► United Air Lines will increase its daily seat capacity 17% this year and plans to fit about 4,620 airline passengers a day. At the end of 1956 United will have 1,000 passenger and cargo aircraft. United transported more than 2.2 million pieces of air transportation literature to students and teachers last year, and 1,158,000 packages are means parcels and static items supplied by United.

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Now I know why the majority of
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never leave. The enthusiasm here - for the
work - the people and the town - is really
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lot of "firsts" in the field of electronics.
Like our Philo Farnsworth, the
inventor of electronic television, and a
real inspiration to all of us here. (I
sound like an old timer, don't I?)

Fact is, Joe, that's the way they make
you feel - like you belong. Here you
will be heard - not just one of the herd.
The whole set up is as good Joe,
I wish you would tell all the other
fellows about the opportunities here at
Farnsworth for good men in R&D
guidance, systems test equipment,
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Tell them to write to:
Don Dionne
Farnsworth Electronics Co., Fort Wayne, Ind.
(A division of International Telephone Telegraph Corp.)

You'll be doing them and
Farnsworth a big favor.

Sincerely
Jack

LETTERS

USAF & Engineers

I have a serial with interest record entries in two letters about USAF Engineer Policy (EW 10 Dec 59). One of the reasons for that change is the fact that the AF Engineers are a large number of engineers which also means I am referring to the BOEIC postulates who go through pilot training.

In recent years almost all AFIC profiles are harmonized with the engineering officer's profile and go to flight training, but the name of the class they are being with is often forgotten.

- a) They can sign a contract as which they obligate themselves to these many years of extra duty as return for advanced pilot training and a guaranteed flying job.
- b) They do not take options out and are obligated for two more years active service in any job in which the Air Force sees fit to put them.

Most of the named categories are reasonably good, but I feel that the "extra duty" column and heading under "except combat crew, supply officers, maintenance officers etc." Since most individuals named said that they have a career in military life to which they would like to return, then we are doing them a disservice. One of the reasons for the formation of course, the reason I am discussing, A senior career has many advantages but to embark upon one at this stage would seem virtual repudiation of the four or five years spent in gaining a technical education.

The problem is not a mode to usage these men to jobs where will not receive strict specialized training, and in most cases, expensive ground school of the AF Force. That is in my knowledge, the "expensive sheet". Air Force is spending such men now.

The number of technically trained men (engineers, physicists, mathematicians, etc.) which are available is estimated, in a relatively untrained manner, as being at the order of magnitude of 600 to 700 men per year.

It is my observation that the USAF does not have a surplus of such men but that it is a case of one hand not knowing what the other is up to.

USAF PATER (Name withheld)

On X-Ray Inspection

String the various men of planetary fame a number of "secret explorers" as X-Ray inspectors of aircraft in composition, with no one to like to remember the fulfillment of one of the "greatest" or even engineering, the late Andrei Pichler of PAVO and his Electron Microscope Division, PAF and the Electron Microscope Division of ADI along X-Ray inspection during intensive research in 1944 through 1946 on the Boeing 314 flying boats. (See McGraw Hill Air Transport March 1945). Charles Allis of BOEIC used the same service at the Balsam mine.

Editorial: We ask welcome the opinion of its readers on the matter raised in the magazine's editorial column, "Aeronautical Engineers," (EW 10 Dec 59, p. 42). Here is one:

"Editor: Please keep letters under 200 words and give a growing bibliography. We will not print anonymous letters. The number of writers will be restricted on request."

We shall listen, as we appreciate the program for the signature of several X-ray inspectors in this country, Triplett & Brotan, Inc., who say that the new design and built light weight continuous duty 160 kW X-ray equipment has been tested severely and successfully. The maximum power output 160 kW units are now in production.

Even so the present business is likely to be small as is shown due.

Charles Dallamore, Manager
R.C. Detectors, Inc.
1034 West Broadway Boulevard
Seattle, California

Government Lethargy

It is unfortunate VINTAGE WEEK's emphasis on the United States Government's indifference to the growing might of Russia at present does not reflect the general public.

With an election fast approaching, states that studies and protection of liberty.

The United States is not alone guilty of dismantling the safety and freedom of their country's. Consider the federal government will face the election ballot very long and return here are also considered main candidates those relatives and protection of liberty.

There are now in mind those who will not see. They are used to deal in those who will see how the answer. It is to be taught, publications in the United States and the administration in the Federal Weather Bureau and practically silent. The public, god, gives the truth before it is too late.

Nancy Wynnmane

Research Into Future

Your editorial of January 2 concerning the "Contest Race in Research" prompts me to expand some. As a long time subscriber to *Aerospace* and *Flight*, I am sure that it contains many comments of the present state of research in our present and future road ahead.

Yet we must look ahead at least ahead in the research and development of existing weapons, assets and designs but of still greater importance is how much can be done in the field of space exploration. In 1959, the aerospace industry will graduate from our engineering schools. If you could get 50,000 students enrolled in an engineering program, half of which return as a civilian (SUS \$18,000 per year with certain added) approximately \$15,000,000 cost in training. This is a conservative figure to 1970 until a proportion to what the cost will be if we fail to match or exceed the progress of Russia in technological fields.

Until while I have your attention now I comment upon several personal correspondences I have had with the USAF. From the variable position of a civilian I am able to express myself fully and soundly enough to talk to tell the Personnel Director that there is considerable advantage in the current policy that conscripts are periodically assigned short of the mark. The position indicated and the USAF have provided and positioned units and flying a dozen or so in during a track and field competition, certainly becomes as did in doing a task.

Young men are attracted to flying careers

by the challenge of mastering one and the skill of a new frontier that he takes and a regular paycheck. The younger generation is the future of the nation as reflected by the Air Force advertising on page—desire thinking and taking part (and it gets up the public), or space planes. I write to suggest this advertising theme—the space ship of tomorrow will be flown by the Air Force pilot in training today.

RANDY E. LANE, M.D.
11711 N.E. Glass Street
Portland 15, Oregon

Engineer Procurement

Very interested VINTAGE WEEK's emphasis on the United States Government's indifference to the growing might of Russia at present does not reflect the general public.

Recognizing the problem at TECOM Center and Lt. Gen. Thomas Power have done well for us to hope from Congress and the administration to provide the necessary funds. When these funds are provided however, the real problems begin—finding enough engineers and technicians in the job.

There are not enough of these trained men and women to do the tasks at the present which is being asked of them. The incomes being offered in these places just to get these folks in route and take a job are approaching the ridiculous. Some ring masters and managers program must be initiated to develop more engineers and technicians.

The present academic institutions which have been forced by an lack of funds needs into the military might be more effective if they were to enter a special engineering program. I have been told the the University of Michigan is doing this. By 1960, the aerospace industry will graduate from our engineering schools. If you could get 50,000 students enrolled in an engineering program, half of which return as a civilian (SUS \$18,000 per year with certain added) approximately \$15,000,000 cost in training. This is a conservative figure to 1970 until a proportion to what the cost will be if we fail to match or exceed the progress of Russia in technological fields.

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